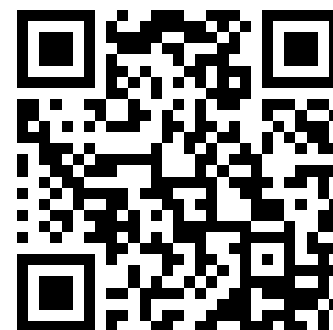

This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

GoogleTM books

<https://books.google.com>



Princeton University Library



32101 050973963

AP



LIBRARY OF
American Institute
of
Electrical Engineers

GIFT OF
Elec. World Engineer

Library of



Princeton University.

654.05

J82

JOURNAL
OF
THE TELEGRAPH.

A RECORD OF THE PROGRESS OF THE TELEGRAPH AND OF
ELECTRICAL SCIENCE:

VOLUME XV.
1882.

NEW YORK:
Western Union Telegraph Company, 195 Broadway.

PRINTED BY
W. F. VANDEN HOUTEN, 60 Cedar Street. New York.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, JANUARY 1, 1882.

WHOLE NO. 340.

THE SCIENTIFIC PRINCIPLES INVOLVED IN ELECTRIC LIGHTING.

By PROF. W. GYLLS ADAMS, F.R.S.

A series of "Cantor Lectures" delivered before the Society of Arts, London, 1881.

(Continued from Vol. XIV, page 370.)

WITH GRAMME MACHINE.

In Auerbach and Meyer's experiments for 800 revolutions a minute, the maximum electro-motive force is 76 volts, and for 51 volts, or two-thirds of the maximum value, there is a current of 6.5 webers through a resistance of 7.8 ohms. Below this value the current is unsteady. With Siemens' machine, a speed of 700 revolutions a minute gave a maximum electro-motive force of 76 volts, and for 51 volts there is a current of 15 webers through a resistance of .6634 ohms. With a small Siemens machine, a speed of 1,000 revolutions per minute gave a maximum electro-motive force of 42 volts, and for two-thirds of this, or 28 volts, the current was 11.2 webers through about 2.2 ohms resistance.

Dr. Hopkinson has investigated the way in which the electro-motive force in a Siemens machine depends on the current. He has shown that:

1. The electro-motive force is, for a given current, proportional to the speed of revolution of the armature.
2. That the electro-motive force does not increase indefinitely with increasing current, but
3. Only increases in the direct ratio as the current increases up to about two-thirds of its maximum value.

The current is very unstable for small change of resistance, or of speed of engine, as long as the value of electro-motive force is less than two-thirds of its maximum value. There is a remarkable difference in the ratio $\frac{E}{C}$ depending on

change of speed from 600 to 700 revolutions a minute, where the current changes from 5 to 15 webers, for this increase of one-tenth of the speed.

As regards the relation of work converted into electrical energy to the work expended to produce it, it appears from the experiments of Mr. Schwendler and Dr. Hopkinson that, with the Siemens machines employed by them, the loss of power was from 12 to 14 per cent., so that if the external resistance of the circuit, i. e., the electric lamp, etc., be so adjusted that half the total work produced appears in the arc, then 43 or 44 per cent. of the total work expended is produced in the arc.

The results arrived at by Dr. Siemens, with his latest machine on Wheatstone's principle are: 1. That the electro-motive force, instead of diminishing with increased resistance, increases at first rapidly and then more slowly towards an asymptote. 2. That the current in the outer circuit is actu-

ally greater for a resistance of $1\frac{1}{2}$ ohm than for one ohm.

With a current of 30 or 40 webers, the horse-power expended was 2.44 h. p., and the effective work 1.29 h. p., giving an efficiency of 53 per cent., as compared with 45 per cent. in the ordinary Siemens machine. The maximum energy which can be converted into heat in the machine is 1.3 h. p. The new machine will give a steadier light with greater economy, and may be driven by a smaller engine.

THE BRUSH MACHINE.

Among the latest continuous-current machines are two which promise to be very successful machines. The Brush, with a ring on the Gramme system, with eight divisions or portions hollowed out to receive the coils, the bobbins at opposite ends of a diameter being connected together and

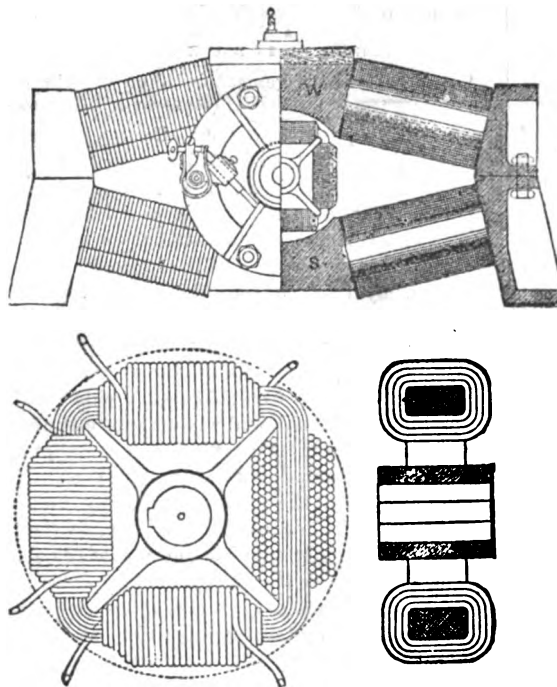


FIG. 5.—The Bürgin Machine.

to a commutator. When a pair of bobbins passes the neutral point, so that there is no current in it, it is put out of circuit for one-eighth of a revolution, so that the current produced in the other bobbins is not wasted, by being sent through the resistance of the two which are producing no current. On the inducing magnets are wound fine wires, offering considerable resistance, which carry the current when the external circuit is open and keep up the magnetism; but when the circuit is closed, the thick wires on the magnets carry the principal part of the current.

The internal resistance of the machine being about 101 ohms and the external resistance 73 ohms,

there was, according to calculation, a current of 10 webers and an electro-motive force of 839 volts. With these numbers, the effective work on the external circuit ought to be 87.36 of the whole electrical work produced; but, practically, it is only 61 per cent.

This relation of work converted into electricity to the work expended in this machine, is about 73 per cent., whereas with both Gramme's and Siemens' machines, with relatively smaller external resistances, this ratio is about 88 per cent.

Another continuous-current machine is the Bürgin machine, from Switzerland, which has only just been introduced into England by Mr. Crompton. Four or six coils are wound on the sides of a square or hexagonal frame, consisting of iron wires. The corners of the frame come very near to the poles of the magnets. There are six or eight of these frames arranged successively in the form of a helix. The action is similar to that of the Gramme machine, the dynamo-electric principle being introduced in this as in other machines. The construction of the machine is very simple, and its efficiency has been proved by M. du Moncel and also by Mr. Crompton to be remarkably good. These machines are of small internal resistance, and are driven at high speed (up to 1,600 revolutions a minute), so that there is considerable electro-motive force.

The efficiency of certain Gramme machines, exhibited by Mr. Crompton and tested at the Glasgow Electric Light Exhibition, was shown to be such that, with a power of 4 h. p. expended in producing the current, only $\frac{1}{4}$ h. p. was expended on friction and passive resistances, so that about 88 per cent. was net power. This $3\frac{1}{2}$ h. p. converted into electricity gave a current of 32 webers through a resistance of about 2 ohms, i. e., an internal resistance of 1.077 ohms, and the arc of a Crompton lamp giving a light equivalent to 2,158 candles.

Now, we may compare with these the results obtained by Mr. Crompton for the Bürgin machine, running at a speed of 1,675 revolutions per minute.

Five machines were tested, and the total work expended was 5.45 h. p. The amount spent on friction and passive resistances, when the circuit was open, was about .25 h. p., so that about 86 per cent. is net power. The work converted into electrical energy, 5.2 h. p., gave a current of 20.15 webers through an internal resistance and conducting wires of 2.8 ohms, together with the arcs of three Crompton lamps (about 5 ohms), each giving a light of 2,103 candles, measured horizontally; the electro-motive force = $\frac{\text{work}}{\text{current}}$ being equivalent to 163 volts.

With photometric measurements made horizontally, the electric light being level with the gaslight,

(RECAP) JUL 24 1899 421264

681

the carbons being concentrically adjusted, and the length of the arc being about 3 m.m., the greatest amount of light was found to be obtained at 1,675 revolutions per minute, with three lamps, each of 2,103 candles, or with 4 lamps, each of 1,246 candles. The upper carbon was 10 m.m. and the negative carbon 13 m.m. in thickness. The consumption of the upper carbon was 4 c.m. and the lower nearly 2 c.m. per hour. The total horse power expended was 5.55 h. p., and the current, with 3 lamps, varied from 18.36 to 21.94 webers, and with 4 lamps, from 16.9 to 19.6 webers. All three lights were very steady and much whiter than the single lights of Gramme's machine.

Mr. Crompton has been kind enough to lend me, this evening, a new Burgin machine, about which he gives me the following facts: It was tried at 1,620 revolutions a minute, and a current of 28 webers was sent by it through 3 lamps, in series. When the arcs were lengthened to one-fourth of an inch each, the current was 24 webers, and the arcs gave a light of 5,000 candles each, the photometric measurements being made in the most advantageous direction.

The British Electric Light Company have been good enough to place at my disposal, for this evening and for my lecture next week, two Gramme machines for trying some of the electric lamps which have been kindly lent to me.

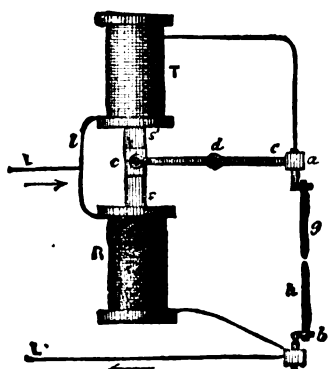


FIG. 6.—Siemens' Differential Lamp.

These machines are driven by a steam engine lent by Messrs. Robey, of Lincoln, and for the Brookie and other electric lamps I am indebted again to the British Electric Light Company, to Dr. Siemens, to Mr. Crompton; to Mr. Latimer Clark for the Lontin lamp; for the Rapiéff and Wilde electric candle, to Mr. Berley; to the Jablochkoff Electric Light Company for their candles; and to the Anglo-American Light Company for the Brush lamp.

THE BROOKIE LAMP.

The upper carbon is attached to an iron tube, which passes into a solenoid, through which it passes as the positive carbon burns away. The solenoid forms a shunt or by-pass for the arc, and takes a small part of the current and holds up the iron tube which carries the upper carbon; as more current passes through the coils, the motion of the carbon is stopped.

A commutator is so arranged and driven by the dynamo machine as to break the current and allow the carbons to come in contact for an instant at regular intervals, say every minute. Then the circuit is completed again, the upper carbon is drawn to its proper distance apart, and the light continues. At every minute the light goes out, but instantly relights, and no variation of light is perceived.

SIEMENS' DIFFERENTIAL LAMP.

A thick-wire bobbin (T) carries the arc current,

and another fine-wire bobbin (B) forms a shunt to the arc. The interval between the bobbins equals the height of each of them. The iron rods *s s'* is of twice the length of each bobbin, and its ends in the normal position are at the centres of the bobbins. The attraction by the thick-wire bobbin tends to lengthen the arc and diminish the current, and so its attraction is weakened and the arc is again diminished, the attraction on the iron being regulated by the change of resistance in the arc. A pendulum arrangement is attached to prevent the oscillations of the carbon from being too sudden.

CROMPTON LAMP.

The carbons are brought together by means of the weight of the upper carbon holder, as in the Serrin lamps. The carbons are controlled by means of an electro-magnet, of which the principal armature separates the carbons, and a light secondary armature is arranged on the back of the large one, and does the more delicate work of bringing the carbons together. The large armature supports the negative or lower carbon; and when the small armature has brought the carbons together, so that a current passes, the large armature separates them to the proper distance apart for a good light. When the arc is broken, the armature, supported by a spring, is raised, and brings the carbons into contact, and relights the lamp. The small variations in the strength of current react on the second armature, which is held at some distance above the large armature by a light spiral spring. The small armature carries an arm, which is applied as a brake wheel, which is the last wheel of a train of wheels set in motion by the weight of the positive rod.

REGULATOR IN BRUSH SYSTEM.

A very pretty arrangement for shunting the current past a lamp (when it is not in use), so that one lamp may be put out without affecting the other lamps in the circuit, is adopted on the Brush system.

The current passes through a solenoid coil, wound with thick wire, and then passes to the upper carbon, through the arc to the lower carbon, and then by the frame to the next lamp. The solenoid holds up a rod of iron, which tilts a ring on one side, through which the carbon passes, and so locks it. To the end of a thick wire of the solenoid is attached a thin wire (150 ohms), which is also wound on the solenoid, and which forms a shunt or by-pass to the arc, taking more and more of the current as the resistance of the arc increases. This thin wire is wound the opposite way, and the current in it relaxes the hold on the carbon, so that it falls away slowly, and then takes more of the current. As soon as it does so it is again held fast. To prevent the carbon from falling too rapidly it is passed through a vessel containing glycerine, and slides downwards very slowly. The current through the thin wire also passes through another solenoid, which forms a shunt or by-pass to the whole lamp, so as to take all the current past the lamp if it should get out of order. When a considerable current flows by this path—i. e., if the arc becomes an inch long, so that its resistance is greatly increased—the second solenoid draws up a piece of iron, which lets all the current pass, and the lamp is thrown out of the circuit.

In the Brush lamp, which is designed to burn 16 hours, there are two pairs of carbons, with the rings on the upper carbons, which hold them by friction, so adjusted that one is held about one-fourth of an inch above the other, and, therefore, the second carbon will not come into action until the first falls or is burnt out.

All the electric candles, such as the Jablochkoff

candle, the Jamin candle, the Wilde candle and the De Mertens candle, consisting of three carbons, are fed by means of alternate current machines, because it is essential that the two carbons should burn away equally. In the Jamin and the Wilde candle the carbons are at first in contact, but when the current passes one of the carbons is separated from the other, because its holder is set on a hinge, so as to be acted upon by a small electro-magnet through which the current passes.

M. Jonbert has found that it is necessary, in order to keep the arc steady with the Jablochkoff candle, that the alternate current in the circuit should have a mean value of eight or nine webers, and that below five webers the arc cannot be kept alight; between the bases of the two carbons forming the candle there is an electro-motive force of 40 or 45 volts. The Jablochkoff candle uses up about 66 kilogrammetres of work, of which 33 kilogrammetres, or 4.6 h. p., is converted into heat and light.

When the arc is produced in a magnetic field, either by disturbing it by an electro-magnet, or by placing a frame around it, as in the Jamin candle, it is necessary to have a current half as large again as when the electro-magnet is not in action. One-third of the energy of the current is in such a case spent in producing a strong magnetic field around the electric arc, and is, therefore, so much wasted energy, as far as the electric light is concerned.

When gas was first introduced extensively for lighting purposes, many objections were raised to its use, and among them was one which was recorded by Clement Desormes, in 1819, which is summed up in the following quotation:

"The light is of a disagreeable yellow color, entirely different from that red and warm gleam of oil lamps; it is of a dazzling brightness; its distribution will be impossible and irregular, and it will be much dearer than oil lighting, and, even if it should be improved, it will still remain much dearer than those lights which we already possess."

Just as Desormes had become accustomed to the red gleam of oil lamps, and objected to the coldness of the yellow gas light, so, a year or two ago a similar objection was raised against the electric light, that it was entirely different from the yellow and warm gleam of gas light; that it is of a dazzling brightness; that its distribution would be impossible and irregular; and that our streets would be left in darkness.

These objections do not seem to be so strongly taken up by the public as they were two years ago, for they have seen several trials of the electric light; and, although there are many difficulties in the way, yet the fact that the electric light has all the colors more uniformly blended, and is, therefore, a whiter light than gas, and enables objects to be seen in their true colors, can hardly be urged any longer as an argument against its use. The same argument might be urged for the same reason against bright moonlight, or against the light of day, and in favor of the yellow London fog. The Kyrle Society, in its search after truth and beauty, must surely be strong supporters of the spread of the electric light.

If we return to the Report of the House of Commons, we find the following statement:

"A remarkable feature of the electric light is that it produces a transformation of energy in a singularly complete manner. Thus the energy of 1-horse power may be converted into gaslight, and yield a luminosity equal to 12-candle power. But the same amount of energy transformed into electric light produces 1600-candle power."

The experiments of Mr. Schwendler, of Dr. Hopkinson, and of others, have shown that, both with the Siemens machine and with the Gramme ma-

chine, 88 per cent. of the total work expended is converted into electrical energy. Theory has established that, if the external resistance of the circuit is equal to the internal resistance of the battery or magneto-machine, the available work in the external circuit is a maximum.

Suppose, then, that we have 40 Grove's cells, each of .25 ohms resistance, and of an electro-motive force of 2 volts, the external resistance being 10 ohms—

$$\text{Then } Q = \frac{E}{R + r} = \frac{40 E}{40 \times .25 + 10} = 4 \text{ webers,}$$

$$\text{and } EQ = 2 \times 4 \times 40 = 320.$$

The work done in the external circuit is $\frac{320}{9.81 \times 2} = 16$ kilogrammetres per second nearly, or about 2.9ths h.p.

(To be Continued.)

THE SANCTITY OF TELEGRAMS.

A QUESTION of wide public interest has been brought to the front by the action of a judge at Shelbyville, in Tennessee. Men of all sorts and conditions now use the telegraph almost as freely as the post-office, not only in the transaction of their business but in social and domestic affairs. It concerns, therefore, every home as well as every enterprise and every industry in the land to know precisely how far messages lodged with telegraph companies are sacred from the scrutiny of third parties.

The Grand Jury at Shelbyville, Tenn., acting under the instruction of the Circuit Court of Bedford County, in that State, in pursuance of a general inquisition into transactions of certain business men of that place in cotton and provision "futures"—on the theory that such transactions are in conflict with the Tennessee laws against "gaming"—the other day caused an order to be served upon the manager of the Western Union Telegraph Company's office at Shelbyville, requiring him to produce before the Court all telegrams "by which contracts or dealings were had with the Nashville Brokerage Association for wheat, corn, rye, cotton and oats, and all messages sent by and to said agency from Shelbyville from August 1 to December 1, 1881, concerning or connected in dealings in futures."

On the return of the order the telegraph company, through its manager, declined to produce its message files, on this ground, among others, that such an order or subpoena was irregular and illegal, as partaking of the nature of a search-warrant or "drag-net," designed to sweep in evidence which might or might not be found after search, and not specifically calling for papers or evidence already shown to exist. It was argued in this behalf by the telegraph company that under the principles of law and under adjudicated cases the only subpoena competent to compel the production of its telegraphic messages is one which designates a paper already shown to exist upon the files, in sufficiently apt terms to admit of its identification, and which does not demand all such telegrams apparently relating to the matter as might possibly be found after the miscellaneous messages of the innocent public as well as of the suspected parties had been scrutinized.

It was further argued by the telegraph company that it is not itself competent to decide what messages on its files concern dealings in "futures;" that it cannot be constituted a judge for the purpose of determining that point; and, finally, that no telegraph company can designate any particular

telegrams from its files as pertinent to such an issue without incurring the risk of thereby disclosing telegrams which are irrelevant, as concerning the transactions of innocent parties, and thus violating its duty to the public as well as a statute of Tennessee, which prescribes the confidential treatment of telegrams and orders secrecy to be observed in regard to them under certain pains and penalties.

The Court, however, on the report of the Grand Jury, overruled the points taken by the telegraph company, and directed compliance with the order, meanwhile shifting the ground with some ingenuity so as to make the Grand Jury further call on the manager to disclose the names of all persons who had sent messages through his office relating to "futures." To do this, of course, would be to furnish material on which to found a competent subpoena. The telegraph company presented substantially the same objections to this demand, arguing that it involved only another method of compelling the doing of an unlawful act, and maintaining that the company claimed for its agents, and for the private papers of the public in their charge, only and precisely the same immunity from "unreasonable search and seizure" which all citizens enjoy under the Constitution as to their persons and their papers; these being expressly within the protection of the Constitution of Tennessee as well as of that of the United States. But the Court held the witness to be in contempt for his failure to comply with the order, and imposed upon him a fine of \$50, with ten days' imprisonment.

The case now rests at this point, the Grand Jury having adjourned, but the unfortunate operator is locked up, and the telegraph company is fined for insisting upon the sanctity of private affairs intrusted to its care.

It is clearly time that an end should be put by legislation to these scandalous attempts at violating the rights of private life under different forms of judicial and legislative inquiry. There is no conceivable reason why telegrams should not be as sacred from investigation and disclosure as letters in the mails.

As to letters, the United States Supreme Court has declared that "The constitutional guarantee of the right of the people to be secure in their papers against unreasonable search and seizure extends to their papers in the mails, and wherever they may be." This last phrase clearly covers and ought to cover the papers of the people when confided to a telegraph company as completely as when confided to the mails.

Justice Cooley, who is high authority, in discussing this general subject, and the analogy between letters and telegrams, maintains, "that the public are not entitled to a man's private correspondence, whether obtainable by seizing it in the mails or by compelling the operator of the telegraph to testify to it, * * * and compulsory process to obtain it [i. e. under *subpoena duces tecum*] would be nothing short of a most arbitrary and unjustifiable seizure of private papers—such an 'unreasonable seizure' as is directly condemned by the Constitution. * * * Perhaps nothing in legal history is more remarkable than the general acquiescence of the public in the asserted right to bring into courts and before legislative bodies, as instruments of evidence, private messages sent by telegraph. It is remarkable, not only because legal analogies and precedents seem to be against the right, but also because the power to make use of telegrams is liable to enormous abuses, and seems to be opposed to one of the first and most vital principles of liberty. * * * It [the production of telegrams] renders one of the most important conveniences of modern life susceptible at

any moment of being used as an instrument of infinite mischief to the community, and one can picture to his own mind about what would be the condition of things in any neighborhood if its whole correspondence were exposed to the public gaze."

Perhaps the settled doctrine of the courts, so far as it can be said to be settled by the limited adjudication so far had on these comparatively novel points, does not go to the extent advocated by Justice Cooley, but rather holds that a telegram is not a privileged communication, and may, therefore, be reached under proper form of subpoena if sufficiently designated. But, except by the Tennessee court in the present instance, it has never been maintained for a moment that a telegraph company may be compelled to sift its files and produce what its agents suppose to be relevant, whether the matter produced concerns the confidential communications of innocent parties or not.

The Western Union Company, which has resisted this assumption, and Mr. O. A. Wallace, its local manager, who has submitted to imprisonment in defense of a most important right of the people, deserve, and will doubtless receive, the thanks not only of the business community but of all right-minded people and all lovers of liberty.—*N. Y. World*.

P. S.—Since the above, after three days' imprisonment, the Supreme Court of Tennessee has granted a supercedas suspending the sentence until the whole matter is reviewed and examined by the Supreme Court.

ELECTRICAL STEEL MELTING.

On Tuesday, October 11th, the members of the Iron and Steel Institute visited the telegraph construction works of Messrs. Siemens Bro., at Charlton, on which occasion Dr. Siemens, F. R. S., exhibited his experiment of melting steel by means of the dynamo-electric current, when five pounds of steel were melted in twenty-five minutes. The apparatus employed consists of an ordinary crucible of plumbago, or other highly refractory material, placed in a metallic jacket, or outer casing, the intervening space being filled up with pounded charcoal, or other bad conductor of heat. A hole is pierced through the bottom of a crucible for the admission of a rod of iron platinum or dense carbon, and the cover of the crucible is pierced for the reception of the negative electrode, which is suspended at one end of a beam by means of a strip of copper. The other end of the beam is attached to a hollow cylinder of soft iron, free to move vertically within a wire solenoid, one end of which is connected with the positive and the other with the negative pole of the electrical arc.

Obviously it matters not how the electricity used in this experiment may have been generated. Any source of power might be employed for driving the dynamo machines. In other words, steel may be melted by water power.

TELEGRAPHERS' AID SOCIETY.

FOLLOWING is a statement of the condition of the Telegraphers' Aid Society up to Dec. 7, 1881. Receipts from all sources since organization..... \$1,174.50 Payments for benefits to members and current expenses..... 662.44

Balance cash on hand..... \$512.06
Total number of members admitted, 143.
WM. MAVER, J. R.,
Secretary.

Journal of the Telegraph.

PUBLISHED SEMI-MONTHLY AT 195 BROADWAY.

THE JOURNAL is issued on the 1st and 16th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,780 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....\$2.00
One Copy, six months, postage included..... 1.00
Single Copies, 10 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$2.00
Half Inch " " 1.00
Quarter Column, " 4.00
Half " " 8.00
One " " 16.00

Cuts charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, JANUARY 1, 1882.

HOSTILE STATE LAWS AGAINST TELEGRAPH BUSINESS.

THE public, as well as telegraph companies, are frequently called upon to witness the diversity of the laws and decisions relating to telegraph companies, either to their property, management, or mode of conducting business with individuals in the various States. This has already reached such an extent that the time is near at hand when national legislation must intervene for the protection of the public conveniences which are afforded by communication by telegraph. In another column may be found a singular case in Tennessee where there is a statute that forbids the disclosure of the contents of telegraphic messages, and a decision or order of a court that all the messages must be examined to see if there are any that may be what the court calls illegal, to wit, "dealing in futures." The question presented, in effect, is whether all the messages received in the State, or sent from there, are subject to be inspected by a mere pretence, it may be, for any assigned cause or information. The telegraph companies are concerned to prevent this only as the servants of the public and to protect confidential messages. If this cannot be done, what can prevent a State passing laws prohibiting sending cipher messages? This is something that would not be advocated for a moment in any community.

We may say, in passing, that there is no law in Tennessee against dealing in futures or against gaming, and it is not contrary to the common law, even gambling itself is not offensive to the common law. But without any further comment on this case we will refer to what the N. Y. World has said of it, which may be found in another column.

About two years since a proposed statute was presented to Congress, asking their action to protect

telegraph communications against hostile State action, either by statutory enactments or by judicial decisions.

It was urged on the part of the company that the telegraph is now a part of inter-State commerce and communication, and as such is entitled to be protected and regulated, if need be, by national legislation. If this be so, the various statutes and decisions relating to the post-office, to railroads, and to express companies, when affected by State legislation, will be applicable to the telegraph. The main point to be at first established is how far telegraphs can be considered to be within the rules applied to post-roads, railroads, and other transactions relating to the carrying of passengers, goods, or communications from, or into, or through the various States. These questions are not new, but perhaps it will be a surprise to many of the Solons who are doing all they can by legislation to impede a fair and constitutional intercourse between the States, to learn that the Supreme Court of the United States has already discussed the principles involved in asking Congress to aid and protect the general public from unjust State interference with telegraph business.

In regard to the telegraph being an instrument of inter-State commerce, and entitled to national protection as such, we will quote the language of Chief Justice Waite, in the U. S. Supreme Court, in *Panacola Tel. Co. vs. Western Union Tel. Co.*, 96 U. S. Rpts., p. 1, as follows:

"Since the case of *Gibbons vs. Ogden* (9 Wheat, 1), it has never been doubted that commercial intercourse is an element of commerce which comes within the regulating power of Congress. Post-offices and post-roads are established to facilitate the transmission of intelligence. Both commerce and postal service are placed within the power of Congress, because, being national in their operation, they should be under the protecting care of the national government.

"The powers thus granted are not confined to the instrumentalities of commerce or the postal service known or in use when the constitution was adopted, but they keep pace with the progress of the country, and adapt themselves to the new developments of time and circumstances. They extend from the horse with its rider to the stage coach; from the sailing vessel to the steamboat; from the coach and the steamboat to the railroad, and from the railroad to the telegraph, as these new agencies are successfully brought into use to meet the demands of increasing population and wealth.

"They were intended for the government of the business to which they relate at all times and under all circumstances.

"As they were intrusted to the general government for the good of the nation, it is not only the right, but the duty, of Congress to see to it that intercourse among the States and the transmission of intelligence are not obstructed or unnecessarily encumbered by State legislation.

"The electric telegraph marks an epoch in the progress of time.

"In a little more than a quarter of a century it has changed the habits of business, and become one of the necessities of commerce. It is indispensable as a means of inter-communication, but especially is it so in commercial transactions. The statistics of the business before the recent reduction in rates, show that more than eighty per cent. of all messages sent by telegraph related to commerce. Goods are sold and money paid upon telegraphic orders. Contracts are made by telegraphic correspondence, cargoes secured, and the movement of ships directed.

"The telegraphic announcement of the markets abroad regulates prices at home; and a prudent merchant rarely enters upon an important transac-

tion without using the telegraph freely to secure information.

"It is not only important to the people, but the government; by means of it the heads of the departments in Washington are kept in close communication with all their various agencies at home and abroad, and can know, at almost any hour, by inquiry, what is transpiring anywhere that affects the interest they have in charge.

"Under such circumstances it cannot for a moment be doubted that this powerful agency of commerce and intercommunication comes within the controlling power of Congress, certainly as against hostile State legislation. In fact, from the beginning it seems to have been assumed that Congress might aid in developing the system; for the first telegraph line of any considerable extent ever erected was built between Washington and Baltimore, only a little more than thirty years ago, with money appropriated by Congress for that purpose (5 Stat., 618), and large donations of land and money have since been made to aid in the construction of other lines (12 Id., 489, 772; 13 Id., 385; 14 Id., 292). It is not necessary now to inquire whether Congress may assume the telegraph as part of the postal service, and exclude all others from its use. The present case is satisfied if we find that Congress has power, by appropriate legislation, to prevent the States from placing obstructions in the way of its usefulness."

Since the above decision a new element of commerce has arisen in telegraph business—this is the transfer of money by telegraph from one point to another. This more frequently occurs where the distance is long than otherwise, hence it may be that it will cross several States, and will be greatly impeded, or, indeed, prohibited, from being carried over the lines without an exorbitant fee, or tax similar to the passenger and freight tax cases of the railroad companies which the United States courts have often been called upon to declare void and unconstitutional.

The people and their representatives should not forget that the telegraph is a public benefit and advantage, and that injury to it is harm to the public at large; that the public is to be considered as above mere local feeling and action, and individual rights are as sacred in telegraph matters as in others.

It is greatly to be deplored that a mistaken local self-interest should be allowed to prevail in legislation against corporations as such, as if they had no rights, forgetting that they must affect individual rights more or less in every instance. It is not a mere question of power with legislators or courts. The public at large have a right to look for justice in legislation and in courts.

WESTERN UNION'S REPORT AND DIVIDEND.

Western Union's quarterly statement, issued yesterday, is rather a surprise to those who have not felt confidence in the company's ability to earn dividends on its \$80,000,000 of capital. The company started July 1st of the present year with \$127,258.76 surplus. After paying its regular quarterly dividends, including the one just declared, and expending \$615,425 for construction and the purchase of new lines, it has a surplus of \$1,013,287.18. This shows a net gain of nearly \$900,000 in six months, after paying \$2,400,000 in dividends. It is claimed by the management that the Mutual Union's competition will in nowise affect adversely these favorable results in the future; that the natural increase of business will be greater than can be done by the other line. In 1870, for instance, the Western

Union transmitted 9,157,646 messages, while for the year ended June 30th last the number increased to \$2,500,000, and 40,000,000 is the estimate for the current year. In 1878, the company's revenue was about 9½ millions, and for the year ended June 30, 1881, it was 14½ millions. In 1878 its profits were about 3½ millions, and for the last year nearly 6 millions. The report shows a continuance of the long-established policy of extending the company's lines by construction and purchase. These expenditures are deducted from income in making up the surplus, and the stockholders are reimbursed for the outlay by a stock dividend whenever the surplus becomes sufficiently large to justify such a course. A cash dividend of 2½ per cent might have been declared yesterday, and a surplus of \$213,287.18 still remained, had the management desired to depart from its established practice. Moderate cash dividends, and large stock ones, have been the Western Union's policy for many years, and it seems to have worked so well that a departure from it is not desired by those most interested.—*N. Y. Daily Stockholder*, Dec. 14, 1881.

If you want to become a telegraph operator, send twenty five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

QUARTERLY REPORT OF THE WESTERN UNION TELEGRAPH COMPANY FOR THE QUARTER ENDING DECEMBER 31, 1881.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, December 14, 1881.

In the Report presented by the Executive Committee at the last Quarterly Meeting of the Board, held September 14, 1881, the net revenues for the quarter ending September 30 (August being partially and September wholly estimated) were stated at \$1,949,894.61.

The official returns for the quarter (ended September 30) showed the net revenues to be \$2,104,635 75, or \$154,741.14 more than the estimate.

The following revised statement, based upon complete returns, will show the condition of the Company at the close of the quarter ended September 30, 1881:

| | |
|--|-----------------|
| Surplus, July 1, 1881, as per last quarterly Report..... | \$ 127,268 76 |
| Net revenues, quarter ended September 30, 1881..... | 2,104,635 75 |
| | \$ 2,231,894 51 |

From which deducting appropriations for—

| | |
|---|----------------|
| Dividend of 1½ per cent, paid October 15..... | \$1,199,708 76 |
|---|----------------|

| | |
|------------------------------|----------------|
| Interest on bonded debt..... | 107,000 00 |
| Sinking Funds..... | 20,000 00 |
| Construction..... | 202,290 51 |
| Telegraph Stocks, etc..... | 118,135 89 |
| | \$1,512,134 60 |

| | |
|---|----------------|
| Less portion of the Sinking Fund for the Bonds of 1900 (which was set aside previously), returned to the Company by the Union Trust Co., Trustees, because of the drawn bonds not having been presented for redemption..... | \$40,000 00 |
| | \$1,602,134 60 |

| | |
|---|--------------|
| Leaves a surplus, October 1, 1881 of..... | \$629,759 91 |
|---|--------------|

The net revenue for the quarter ending December 31, instant, based upon official returns for October, nearly complete returns for November,

| | |
|--|----------------|
| and estimating the business for December, will be about..... | \$2,010,527 27 |
| Add Surplus, October 1, as above..... | 629,759 91 |
| | \$2,640,287 18 |

From which appropriating for—

| | |
|--|--------------|
| Interest on Bonded Debt..... | \$107,000 00 |
| Construction and purchase of Telegraph Stocks and Properties.. | 300,000 00 |
| Sinking Funds..... | 20,000 00 |
| | \$427,000 00 |

| | |
|---|----------------|
| Leaves a balance of..... | \$2,213,287 18 |
| It requires for the payment of a dividend of 1½ per cent. on the Capital Stock..... | \$1,200,000 00 |

| | |
|---|----------------|
| Deducting which, leaves a surplus, after paying dividend, of..... | \$1,013,287 18 |
|---|----------------|

In view of the preceding statements, the Committee recommended the adoption by the Board of the following:

Resolved, That a dividend of one and one half per cent. be, and is hereby declared payable on the 16th day of January next, to stockholders of record, at the close of business on the 20th day of December, instant.

Resolved, That for the purpose of such dividend, the stock books of the Company be closed at three o'clock on the afternoon of the 20th day of December, instant, and be reopened on the morning of the 17th of January next.

Respectfully submitted,
NORVIN GREEN,
President.

Correspondence.

TITLES IN SIGNATURES.

DALLAS, TEX., Dec. 17th.

To the Editor of the Journal of the Telegraph.

In a message where the signatures are—say

"J. W. Jones,

Pres't. Cotton Exchange,

Paul Kennedy,

M. O. Crawford."

Please decide for us how many extra words should be counted and why? Respectfully,

"Inquirer."

Ans.—See Executive Order [No. 174, 15th of November, 1878, Vol. XI., No. 265.

"The title of the sender of a message, when such title does not exceed two words, will not be included in the check, but will be transmitted free of charge as part of the sender's message."

By above rule one extra word should be charged for the title to first name, two extras for second name, and three for last name, six in all.

CHICAGO ELECTRICAL SOCIETY.

CHICAGO, Dec. 21, 1881.

To the Editor of the Journal of the Telegraph:

The fifty-third regular meeting of the Chicago Electrical Society was held last evening in Club Room No. 4, Grand Pacific Hotel, President C. C. Haskins in the chair.

The weather was extremely unpleasant, rain and wind combining to dampen and chill the enthusiasm of all. Despite these untoward influences, the room was filled, and after the usual routine business, Mr. G. W. Felton, manager of the Chicago office of the Western Union Telegraph Company, was introduced and read a highly interesting and instructive paper on "Ocean Currents," which was listened to with marked attention and greeted with enthusiastic and merited applause.

Your limited space forbids a lengthened critique of Mr. Felton's paper, but it is sufficient to say that it was exhaustive and replete with fact and detail

on the character, influences and causes of these great and constant commotions of the vasty deep, which are so potent in climatic results throughout the globe. But for these currents the Grand Banks of Newfoundland would never have had an existence, and the telegraph plateau of the North Atlantic would have been an impossibility. The lecturer showed by adduced evidence from Maury and others that the causes of all these stupendous movements are traceable directly to evaporation and thermometric influences and varying densities resulting from these differences.

The society has reason to be proud of its position and ranks to-day with the foremost societies of a scientific character in the United States, if not with those more pretentious in foreign climes.

Papers are now provided for the remainder of the season, and a regular meeting will be held each month.

For January we are to have Prof. T. W. Tobin, of the Louisville Polytechnic, (late the assistant of Pepper in the London Polytechnic), on electro-motive force.

February, March and April meetings will be supplied by Messrs. Park, Thomas and Delamater, and at the closing meeting of the season, the President of the society has promised us a paper on the "Universality of Vibrations." D.

THE YOUNGEST OPERATOR.

STRASBURG, VA., December 24th, 1881.

To the Editor of the Journal of the Telegraph:

I notice, in your issue of December 16th, an item of news headed "The Youngest Telegraph Operator." I taught a young child in my office, in 1880, in his seventh year; and when he was eight years old he was fully qualified to take charge of a telegraph office. He received and sent messages with Edward Stewart, one of the champion senders, then in Washington City; it was on line No. 18, running from Staunton, Va., to Washington, D. C., this little operator, Master Owen Conner, worked. His father, John Conner, at that time was building manager on the S. V. R. R., between Waynesboro, Va., and Hagerstown, Md., but is now superintending the building of lines west of Cumberland, Md., and Pittsburg, Pa., for the Western Union Telegraph Company. P.

THE SEAMY SIDE OF THE TELEGRAPH.

In the midst of the indignation aroused by the "cornering" operations which have lately been exposed in the chief center of our cotton trade, it was only natural that the telegraph should come in for some share of the blame. It is much easier, besides being safer, to reprobate a thing than to openly assail an individual; and while there is much righteous indignation exhibited against the wrong doers in general, it is aimed most directly at what are called the facilities for wrong doing. Foremost amongst these facilities undoubtedly stands the telegraph; and it is, therefore, roundly accused of being the prime instrument of a vast deal of financial plundering. We do not mince the word, for it is impossible to class the practices lately brought to light in the Cotton Metropolis among the legitimate operations of either trade or finance. What we demur to is that the telegraph is responsible. If the writer in this month's *Nineteenth Century*, who briefly treats on the subject of "corners," had been as explicit in his charges against the wielders of the in-offensive agent as he is against the agent itself we should have had no fault to find with him; but in effect he sets most of the mischief down to the tele-

graph, and people who take a pessimist view of affairs might consequently be inclined to wish the telegraph banished to the place where political economy is said to have gone, if the disorganization of the trade is the price we have to pay for it.

Of course Mr. Halhed, the writer of the article on "Commercial 'Corners'" we are referring to, does not go this length; nor probably is there anybody living seriously desirous of impairing our means of communication because they are liable to be used for sinister purposes. But it may be well to draw attention to the reverse of the picture, and while admitting that there is a seamy side of it, to claim for it what is rightly its due. There are some inventions which almost from the very first have suffered by reason of ugly associations. Dynamite and nitro-glycerine provoke a shudder at the mere mention of them these days, and even gun-powder must have had a bad time of it in the reign of James I. For the telegraph, however, everybody has had a kindly and grateful word to say until now; and although its mission is by no means jeopardized, we may be naturally jealous of its fair reputation.

There is no denying that this convenient and, for the most part, harmless invention has been made to serve very questionable practices. It is notorious that gambling on the turf has greatly increased under its ministrations, and that speculation on the Exchange has been fostered by its aid—it is probable, indeed, that both these branches of industry will go on increasing. Trading in "futures" is largely due to the growing rapidity with which news can be interchanged between the country where cotton is grown and those countries where cotton is wanted. The same process is threatened with regard to horse racing. An American paper lies now before us, and among news from "The Old World" we notice an item headed "Suspensions that Lorillard's Iroquois is being jockeyed," followed up by the intimation that "none of the [London] sporting papers yesterday name him as the winner." This was printed in America on the day of the St. Leger, and is accompanied by the latest London betting in detail. There is, therefore, some ground for apprehending that wherever and whenever it can, as in these cases, serve the ends of those idle persons who have plenty of wits and an overmastering greed after money, the telegraph will be liberally patronized by them. We cannot prohibit the adventurer from using the telegraph, and the telegraph cannot be blamed if that class of persons thrive and multiply. Possibly the moralist may find some consolation in the fact that the telegraph wires are made the vehicle for messages which are in the highest degree proper. The same paper we have just now quoted from informs the American public that, "the meetings of the Methodist Ecumenical Council" is "the overshadowing topic in London," and gives a great many particulars of this overshadowing topic which we on this side of the Atlantic had sinfully overlooked. We are also informed, or rather the American reading public are informed, of "The Irish People Becoming more Reconciled to the Provisions of the Land Act." In this case we have taken the evidence as read, contenting ourselves with the heading and its big capitals, lest our faith might be shaken. Nobody will take exception to such news at this, unless it be on the score that we who have a stake in the matter are forbidden to believe it. Glancing at the columns of telegraphic intelligence from this and every country in Europe, all up to date, we cannot but be gratified that our American cousins continue to take such a warm interest in us and our surroundings.

It would in all seriousness be idle to combat the notion that the telegraph is in the least degree an

offender in this relation. Many foolish and improper messages are signalled by means of electricity, just as many unwise and unrighteous missions were undertaken on horseback before even stage-coaches were dreamed of. The fault is not in the machinery but in the human hands that set it going. The outcry against "cornermen" will, it may be hoped, do good service in awakening public conscience as to the true bearings of their transactions. They were no less iniquitous when they were fewer. That the telegraph has made them more numerous is not wholly to be regretted if public opinion, which moves but slowly, is at length brought to see their true enormity. When things get to their worst they are sure to mend; it is a saying that is true of the facts of life, though it does not content the impatient moralist. And if anything will hasten the bitter end, and land us quickly at that crisis which enables us to mend our ways, surely it is none other than the telegraph. The tolerance allowed to sins of small consequence will not be extended to those of great magnitude; and the telegraph more than anything else makes them grow hugely. For our part we are not sorry that this should be the case. If, as Carlyle tells us, we want a new soul in matters commercial, the sooner we get it the better; and if the sins committed by the old Adam with the help of the telegraph induce us to put on the new Adam a few years earlier than we otherwise should do, the telegraph will deserve our gratitude. The true criminal is the unscrupulous user. He has made himself conspicuous, notorious, hateful by prostituting an innocent medium of social and commercial intercourse; and it may be hoped that the rope that has been given him without stint will speedily hang him without mercy.—*The Electrician*.

THE ELECTRIC SEMAPHORE.—WATSON'S NEW ELECTRIC SIGNAL.

THE Provincial Exhibition at Montreal, held in the month of September, attracted large crowds of visitors. One of the most interesting objects for an editor of the *Railroad World* was an invention displayed among the machinery, and called "Watson's Electric Railway Semaphore Signal." Accidents on railroads arising from defective signalling are of far too common occurrence to allow us to neglect any contrivance which tends to lessen their number. The present system of railroad signalling is very defective. In the first place, the signal post is in many cases a great distance from the station, and very often is not visible from it. In the second place, it relies for its efficiency entirely on the switchman or signalman placed there to work it; on his vigilance and judgment the lives of thousands every day depend. Mistakes, too, will be made even by the most vigilant and careful of men. The task that has to be performed regularly day after day, for train after train, becomes at last mechanical. Long training and practice undoubtedly enables us to discharge a duty mechanically and yet successfully, but a day will come even to the best trained when something throws him off his balance. He will be a few seconds too late in working his signal; he will unthinkingly lay his hand on the wrong lever, and then the enterprising reporter has an opportunity to write some neat paragraphs with display heading—"Dreadful slaughter! Flight of the signal man. List of the victims."

This is a risk to which all of us who travel on railroads are exposed, and, therefore, the public ought to welcome any invention which renders such accidents preventable. As an accident is the most expensive amusement in which a railroad company can indulge, railroad men ought to examine stud-

iously every possible or probable means of avoiding them, not merely to shield themselves from heavy responsibility, but for the sake of their dividends. How negligently signal duty is, too often, performed the series of accidents which took place a couple of months ago at Rye, on the New Haven line, gave fatal proof. Well managed as that line is, its system of signalling as laid down in its instructions was far from perfect, while in practice, it was found when a coronor's jury investigated the matter, these instructions were, we may say, systematically neglected. It is claimed for the Electric Semaphore that it obviates all the dangers at present likely to happen from devolving the duty of signalling to the humblest class of railroad employes. A few brief words will render the illustrations of it, which we present herewith, intelligible to the lay reader. It consists of the usual semaphore signal post, with arms, but the semaphore is connected by two ordinary telegraph wires, with an indicator and key placed in the depot, and which can be worked either by the telegraph operator or by the train despatcher. The arms of the semaphore revolve in the same manner and the same time as the hand of the indicator, and thus the operator can discover at a glance at what signal the lever stops. At each pressure of the key about an eight of a circle is described by the arm of the semaphore. The operation is repeated, by pressing down the key, till the required position is reached. The key to be pressed is a button similar to those attached to electric bells in hotels, the signal operates at once and at any distance, while the indicator in the office close beside the key tells him unerringly which of his three signals he has given. The arms assume three positions, as usual in all semaphores: Clear, Caution and Danger. By night, also, the usual methods are adopted. A disk, containing white, green and red glass, is placed before the signal lamp on each side of the light, and these are worked like the arms directly by the train starter. If, for example, the line is not clear, the glasses are moved till a red disk covers the lamp: the arm of the semaphore is in a horizontal position, and the indicator points to R, or red.

One of the commonest objections brought against many new inventions is that they are too complicated. This is as simple as ringing a bell. Another objection is that they are too expensive. This is not the case with the Watson Electric Semaphore. It costs less than the one now in use, nothing more being required than two ordinary telegraph wires instead of the heavy rods used in the present method: it is economical in working, as the signal can be worked by the depot operator, thus dispensing with the cost of a switchman. Moreover it is so constructed that the arms and lamps automatically indicate danger in the event of anything happening to the wires or the indicator, thus ensuring the greatest safety from accident. Another device to preclude carelessness on the part of any official is a contrivance by which the mechanism of weights moving the arms, can only be moved up after the lamps are lighted and the lamps can only be lighted while the mechanism is not run down. In all cases this semaphore is the cheapest for the reason we have stated: at small stations it would be invaluable. In them a switchman has several duties to perform, and this electric system connected immediately with the depot leaves him entirely free to discharge them.

On single track roads, by placing them between stations, collisions could be avoided by bringing the signal to danger after the train had left the station. A third advantage of Watson's system is that it can be used as successfully in winter as in summer, for

its action is not influenced by snow or ice on the wires. Anything that improves our system of signals, whether by semaphore, or by flags, or by whistles, or by gestures, deserves attentive consideration. That the semaphore we have described is appreciated in Canada is proved by the award of a Gold Medal to the inventor, Mr. Watson. Patents have been taken out for it in the United States and Great Britain as well as Canada.—*Illustrated R. R. World.*

[From *Youth and Pleasure.*]

ENEMIES OF THE WIRE.—HOW WILD BEASTS, WORMS AND INSECTS CONSPIRE TO DESTROY THE TELEGRAPH.

If you will kick or pound on a telegraph pole, or place your ears against one on a windy day, what will the noise remind you of? A hive of bees? Precisely. So it does the bears in Norway. Bears are passionately fond of honey, and when, in one of the wild districts, bruin hears the humming of the wires, he follows the sound to the post where it is the loudest and begins to tear away the stones heaped around the poles in rocky soil to steady them in order to get at the hive which he imagines to be there. In his disappointment and disgust he usually leaves savage marks of his claws in the wood. Nor is he the only victim of the wires. In the electric exhibition at Paris they show the top of a thick pine telegraph post through which a woodpecker had drilled a hole several inches in diameter. The bird had apparently perched on the pole and taken the humming of the wires for the buzzing of a nest of insects in the wood, and had set himself manfully—or rather birdfully—to dig them out. Wolves will not stay in Norway where a telegraph line has been built. It was formerly the custom to protect farms by planting poles round them strung with cards something like rabbit snares, and gradually the wolves came to respect these precautions, so that a line stretched across the neck of a peninsula would protect the whole district. The wolves take the telegraph for a new and improved snare, and promptly leave the country when a line is built. On our own treeless plains the buffalo hails the telegraph pole as an ingenious contrivance for his own benefit. Like all cattle, he delights in scratching himself, and he goes through the performance so energetically that he knocks down the post. An early builder of telegraph lines undertook to protect the posts by inserting bradaws into the wood; but the thick-skinned buffaloes found the bradawl an improvement, as affording him a new sensation, and scratched down more poles than ever. In Sumatra the elephants are systematically opposed to telegraph lines, and at least twenty times a year make raids on them. In May, 1876, the elephants tore down the poles for a distance of several furlongs, and hid the wires and insulators in the cane jungle, and for three nights in succession they repeated the performance as regularly as the repairers built the line during the day. The monkeys and apes are about as formidable enemies, as they use the wires for swings and trapezes, and carry off the glass insulators as valuable prizes; then, when the repairer goes to correct the mischief, he may be pounced upon by a tiger, or driven up the post by a mad buffalo. In Japan the special enemies of the telegraph are the spiders, which grow to an immense size, and avail themselves of the wires as excellent frameworks for their webs. So thick are the cords the Japanese spiders spin that often, especially when they are covered with dew, they serve to connect the wires with each other or the ground, and so to stop them from working. In the sea the wires are

not any safer, as a small worm has developed itself since cables came into fashion, which bores its way through iron wire and gutta-percha, lets in the water, and so destroys a line worth millions of dollars. When a great storm comes on in the centre of the ocean, and the cable breaks while it is being laid, or threatens to break, no one is alarmed. They fasten the cable to a buoy and come back afterward and pick it up, or if it is at the bottom of the sea they drop a dredge with a mile or so of rope and fish out the precious thread as large as one of your fingers, almost as easily as you would fish up a penny from the bottom of a tub of water with the tongs. But the little worm no bigger than a needle is more formidable than the elephant on shore or the hurricane at sea.

GUARDING AGAINST ELECTRIC LIGHTS.

THE regular weekly meeting of the Polytechnic Association, a branch of the American Institute, in New York City, was held Thursday evening, Dec. 15th, 1881, the President, Mr. Stetson, in the chair.

Mr. Keith read the rules lately put in force by the Board of Underwriters of New York City, in regard to the manner of putting in electric light apparatus in buildings in this city, to avoid danger from fire. The rules go to an extreme of caution. Mr. Keith explained that the electric light companies already largely exceed the required conductivity, 50 per cent. excess. The smallest, even with the arc system, is No. 8 wire. It conducts the current without being appreciably raised in temperature. Heat is generated in a conductor when it is too small to carry the current freely. No. 16 is large enough; it will only raise the temperature to about 110 degs. Fah. With the incandescent system most companies use larger wire, up to No. 3. These wires are a fourth of a square inch in section. The electric resistance of a small wire absorbs and wastes power which otherwise would show itself as light at the lamps.

The case was analogous to passing water through pipes; a small pipe requires more head, or force, to cause the passage of a given quantity of steam, or any fluid, in a given time, and the working pressure at the delivery end is reduced by the wire-drawing.

Mr. Keith averred that the brick, or plaster walls and ceilings of a building are as good insulators as any insulating substance which can be put around the wires. Dry wood is nearly or quite as good. He thought there was no advantage worth considering in an insulating covering for wires on the ceilings; but such was important in places upon the floors or walls where there is a liability of some conducting substance touching both the inlet and the outlet wires.

Where the positive and negative wires run near together they should be well covered by some non-conducting substance, which will absolutely prevent accidental contact with both at one time. The rules were sound on that.

There is not a particle of danger in touching one wire with any substance at any place. All thought the practice of returning the current by the earth, or by connections to water or gas pipes, should be absolutely prohibited. Doing so makes all conducting substances in connection with the earth a return conductor.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

CARS LIGHTED BY ELECTRICITY.

From the *London Times.*

A TRIAL trip was made yesterday by the new Pullman car train, which will begin its regular service on the London, Brighton, and South Coast Line, between the Victoria Station and Brighton, on Monday, the 5th inst. Single cars of the American pattern have been running on this line for five or six years, but this train is made up entirely of Pullman cars. The train includes a parlor car, a drawing-room car, with ladies' boudoir and dressing room, a restaurant car, and a smoking car, while a compartment at each end of the train next to the luggage compartment is provided for servants. The cars are kept at an equable temperature by means of hot water pipes. There is electric communication between the parlor, drawing-room, and smoking cars and the restaurant car, and in many ways the comfort of passengers is provided for. The most important and novel feature of the new train is, however, that it is lighted throughout by electricity. As the train entered Box-hill and other tunnels on the Dorking, Horsham, and Steyning route, by which the trip to Brighton was made, the cars were simultaneously, and by the mere turn of a handle, brilliantly lighted, and as quickly, when the train emerged, the light was turned off. On the return journey the cars were lighted all the way from Brighton to Victoria, the lamps burning with a steadiness undisturbed by the motion of the train. The trial confirmed the results of an experiment made some few weeks ago with a single car, and proved the possibility of satisfactorily lighting a whole train by electricity. The lamps used yesterday were Edison's incandescent lamps, of which altogether there were 29 distributed in various ways throughout the train, the drawing room car being sufficiently illuminated with an effect of pleasantly diffused light by five of them. Each lamp was computed to be giving a light equivalent to that of nine or ten candles. As one of these Pullman cars is 58 feet 5 inches long, the length of train to be lighted was over 233 feet. The electricity was supplied by Faure accumulators, of which 80 were carried. Mr. W. Lachlan, the engineer representing the Societe La Force et La Lumiere, who was in charge of the batteries, reported that but 30 were brought into use on the down journey, and only a portion of the electricity stored in these was expended. On the up journey these and four fresh boxes were brought into operation. For the present the accumulators will be charged each evening at the society's depot at Charing-cross, but as soon as the necessary arrangements can be made it is intended that the recharging shall be done at Victoria with a dynamo machine worked by a small stationary engine. It is not improbable, however, that before long the electricity required may be generated on the train itself, the chief practical difficulty in the way of this saving of force arising from the unavoidable alterations in the speed of the train—a mechanical difficulty in the way of charging the accumulators in this way which the ingenuity of the electrical engineers will no doubt soon overcome.

VICK'S FLORAL GUIDE.—Of the many Guides and Seed and Plant Catalogues sent out by our Seedsmen and Nurserymen, and that are doing so much to inform the people and beautify and enrich our country, none are so beautiful, none so instructive as *Vick's Floral Guide*. Its paper is the choicest, its illustrations handsome, and given by the thousand, while its Colored Plates are gems. This work, although costing but ten cents, is handsome enough for a Gift Book, or a place on the parlor table. Published by JAMES VICK, Rochester, N. Y.

Tariff Bureau.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, January 1, 1882.

To all offices on Western Union lines:

NEW TARIFF BOOK.

Managers of offices at places where Western Union lines are connected with those of other companies should notify those in charge of such "other" lines of the change in method of computing tolls on night messages to and from Western Union offices.

THE JOURNAL of December 16, 1881, contains a number of changes and corrections which should be made in the new Tariff Book. The following have been made since December 16, 1881.

ALABAMA.

285 Wilhites, closed.

CALIFORNIA.

790 Antelope, closed.
769 Crescent Mills, closed.
806 Etna, closed.
800 Pacheco, closed.
761 Tahoe City, closed.

COLORADO.

557 Deansbury, closed.

CONNECTICUT.

87 Watertown, closed.

DAKOTA.

903 Lake Preston changed to 903 Preston.

FLORIDA.

187 Folkston, closed.

ILLINOIS.

538 Mulkeytown, closed.
810 Boland, closed.

INDIANA.

800 Chandler, closed.

KANSAS.

503 Cottonwood, P. O. Strong City.

KENTUCKY.

• Morehead now 45 3 Lexington, Ky., or 50 3 Huntington, W. Va. Erase "25 2 Mt. Sterling."
• Morgantown now 25 2 by telephone, Henderson. Erase "25 2 by telephone Mt. Vernon, Ind."
• Olive Hill now 50 3 Lexington, Ky., or 40 3 Huntington, W. Va. Erase "25 2 Mt. Sterling."
• Springfield, now • Springfield, 25 1, by telephone, Lebanon.

LOUISIANA.

433 Marthaville, reopened.

MARYLAND.

103 Clear Spring, closed.

MASSACHUSETTS.

• • Cotuit now • Cotuit, 15 0 by telephone, W. Barnstable.
21 E. Fomerville, Erase "Ok Fall River."
• • Marston's Mills, now • Marston's Mills 15 0, by telephone, W. Barnstable.
• • Osterville, now • Osterville 15 0, by telephone, W. Barnstable.

MEXICO.

The tariff for "other" lines to the places named below is now 75 and 7 from Brownsville, Tex.

| | | |
|----------------|----------------|-------------------|
| Bagdad, | Laredo, | Reynosa, |
| Cadereyta Jim, | Linares, | Salinas Victoria, |
| Camargo, | Marin, | Saltillo, |
| Cerralvo, | Mier, | Villaladama, |
| Guerrero, | Monte Morelos, | Villagran, |
| Lampazos, | Monterey. | |

MICHIGAN.

119 Onokama now • • Onokama. By mail, Manistee.
270 Robinson, closed.
119 Stronoch. Erase "Ok Manistee."

MINNESOTA.

886 Young America now checked direct.

MONTANA.

• Miles City is now W. U. office, square 958.

NEVADA.

714 Pine Sta., closed.

NEW YORK.

110 Albion is in Orleans Co.
65 Cuyler, closed.
40 Olive Branch and Olive Bridge, closed.
65 Otsele, closed.
51 West Flats changed to 51 Rockland.

NORTH CAROLINA.

Gibson's Store. P. O. Laurel Hill.

OHIO.

242 Easton, on page 226 of Tariff Book, should read 242 Eaton.
170 Strasburg is in Tuscarawas Co.

PENNSYLVANIA.

59 Balto. Cent. Junc., P. O. Wawa.
66 Dreshersville, etc., now 66 Dreshersville, etc.
151 Nobletown, closed.
59 Willow Grove is in Montgomery Co.
59 Wissahickon, now • • Wissahickon, 50 0 Manayunk, Phila. Co.

SOUTH CAROLINA.

• Union, now 30 2 Spartansburg. Erase the abbreviations ("N. M.")

TEXAS.

649 Burleson, P. O. Oak Grove.
• Black Jack Grove, now W. U. office, Square 510.
• Ceburne now (N. M.) 50 3 Galveston. Erase "50 3 Fort Worth."
• Daingerfield, now W. U. office, Square 470.
• Hughes Springs, now W. U. office Square 470.
• Lewisville, " " " " 642.
• Sulphur Springs, " " " " 479.
488 Thornton, closed.
• Winstboro, now W. U. office, Square 470.

All other line offices in Texas, with "Tariff for other lines" from Galveston are now (N. M.) offices.

VERMONT.

• • Pawlet now • Pawlet, 15 2 Factory Point.

VIRGINIA.

153 Big Lick changed to 153 Roanoke.

SPECIAL RATES

Under the head of "Special Rates," in the circular of December 16, 1881, is a notice which directs that there must be no increase of special rates on the first of January, 1882. This order refers to "Sheet K" and other rates lower than the old State and Square rates which may be found to be below the new State and Square rates; it also covers special rates from "Sheet K" offices to offices in Ontario and Quebec and those from "Sheet K" offices to Adams, Alexandria Bay, Cape Vincent, Chaumont, Clayton, Mexico, Ogdensburg, Pulaaki and Watertown in New York.

Night Messages between offices which have to each other a special rate should, unless otherwise ordered, be charged for as per the table of Night Message Rates in the new Tariff Book.

ATLANTIC CABLE.

The cables between Wladivostock and Nagasaki, and between Amoy and Shanghai are interrupted; pending the repair of the Amoy and Shanghai cable, messages for Shanghai and Japan will be sent by Post from Amoy or Hong Kong. Charge Falmouth rate until further notice.

The cable between Santa Catherina and Rio Grande do Sul, South America, repaired.

CUBA CABLE.

The cable between Trinidad and Demerara interrupted. Messages will be sent by best means during interruption.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in double columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in

the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

ALABAMA.

285 Bangor.
294 Calera.
223 Epes.
• Ft. Morgan, 75 5 Mobile.
• Gainesville, 25 2 Epes.
• Point Clear, 50 3 Mobile.

ARIZONA.

659 Holbrook.
659 Winslow P. O. Brigham City.

ARKANSAS.

891 Jacksonport.
449 North Brook.

COLORADO.

546 Agate.
565 Boreas.
540 Buffalo, Weld Co.
623 Calumet.
551 Carr.
545 Denel, P. O. Morgan.
541 First View.
545 Godfrey, P. O. care Dear Trail.
545 Hardin, P. O. care Evans.
293 Falkville.
324 Prichard.
364 Stock Mill.
590 Holleys.
599 Hortense.
623 Hot Springs.
634 Ignacio.
540 Liff, P. O. care Big Spring, Neb.
557 Red Cliff.
628 Sargents.
558 South Pueblo, Ok. Pueblo.

CONNECTICUT.

• Naubuc, 30 3 Hartford.
• Noroton, 10 0 by telephone, Stamford.
• Winnipauk, 10 0 by telephone, Norwalk.

DAKOTA.

915 Chamberlain.
947 Dickinson.
890 Hillsboro.
926 Hitchcock.
895 Mayville.
898 Montrose.
920 Northville.
915 Ordway.
903 Preston.
• Crook City, 50 2 by telephone, Deadwood.
• Pine Ridge Agency, 150 9 Cheyenne Wy.
• Rosebud Agency, 175 10 Cheyenne, Wy.
• Spear Fish, 50 2 by telephone, Deadwood.
• Sturgis City, 50 2 by telephone, Deadwood.

FLORIDA.

• Highland, 50 4 Lake City.
• Moccasin, 50 3 Lake City.
• Paola, (N. M.) 100 6 Lake City.

GEORGIA.

207 Dubois.
246 East Point.
187 Folkston, P. O. Centre Village.
216 Lula.
227 Oglethorpe.
• Abbeville (N. M.) 40 3 Ft. Gaines.
• Arlington, 40 3 Ft. Gaines.
• Blakely, 40 3 Ft. Gaines.
• Senoia, (N. M.), 25 2 Newnan.

ILLINOIS.

300 Allendale.
307 A pine.
328 Beecher City, Effingham, Co.
329 Belknap.
337 Breckencridge.
347 Oakford.
337 Rockville.

INDIANA.

280 English Lake.
253 Letts Corner.
298 Lowell.
262 Milroy.
290 Paxton.
253 Westport.
• • Ferdinand. By mail, Ferdinand Station.
• • St. Meinrad. By mail, Ferdinand Station.

IOWA.

367 Buffalo.
425 Dakota City.
367 Fairport.
416 Galt.
407 Girard.
425 Irvington.
454 Irwin.
435 Lake City.
407 Laurel.
397 Libertyville.
367 Montpelier.
455 North Boro.
473 Pax.
407 Van Cleave.
425 West Bend.
425 Willow Glen.

KANSAS.

517 Alum Creek.
456 Argentine.
466 Barclay.
527 Cleveland.
517 Clinton.
527 Collyer.
514 Galva.
506 Hazelton.
503 Horton, P. O. care Emporia.
475 Wakarusa.
466 Westphalia.
• • Cottonwood Falls, 50 0 Cottonwood.
• Enterprise, 15 0, by telephone, Detroit.

KENTUCKY.

263 Bloomfield.
263 Crescent Hill.
• Clay Lick, 25 1 by telephone, Worthville.
• Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Huntington, W. Va.
• Eastern Junc., 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
• Flemingsburg, 15 2 by telephone, Johnson Junc.
• Gistville, 25 1 by telephone, Worthville.
• Gratz, 25 1 by telephone, Worthville.
• Lockport, 25 1 by telephone, Worthville.
• Marion, 15 1 by telephone, Worthville.
• Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
• Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. Va.
• Port Riffe, 25 1 by telephone, Worthville.
• Bush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
• Springport, 20 1 by telephone, Worthville.

LOUISIANA.

- 424 Kola. 442 Pleasant Hill.
 424 Garford. 433 Provencal.
 442 Grand Cana. 433 Robilue.
 354 Lookout. 442 San Patrice.
 434 Mermontau. 442 Stonewall.
 383 Mounds Sta. 444 Whitesville.
 • Milikens Bend (N. M.), 40 3 Tallulah.
 • Plaquemine, 10 3 New Orleans.
 • St. James, 50 3 New Orleans.
 • Vacherie, 50 3 New Orleans.

MARYLAND.

- 67 Edgewood. 54 Pocomoke Station.

MASSACHUSETTS.

- 31 Conway. 21 Wellesley Hills.
 • Bass River Harbor, 05 0 by telephone, So. Dennis.
 • Ocoheesett, 25 0 by telephone, East Bridgewater.
 • Hyannisport, 15 0 by telephone, Hyannis.
 • Lunenburg, 30 0 by telephone, Fitchburg.
 • Matfield, 50 0 East Bridgewater.
 • Me rose Highlands, 75 0 Melrose.
 • South Mills, 10 0 by telephone, New Bedford.
 • Westham, 35 0 by telephone, Providence, R. I.
 • West Bridgewater, 15 0 by telephone, East Bridgewater.

MEXICO.

- Paso del Norte, 05 0 El Paso, Tex.

MICHIGAN.

- 220 Beech. 137 Indian River.
 281 Bridg water. 231 Jerome.
 210 Brockway Centre. 210 Mariette.
 119 Free Soil. 210 Mayville, P. O. May.

MINNESOTA.

- 190 Argyle. 870 Osawa.
 8 5 Arlington. 8 9 Rock Island Quarry.
 865 Hamburg. 876 Vernon Centre.
 889 Kennedy. 865 Waconia.

MISSISSIPPI.

- Arcola, 80 6 Vicksburg.
 • Johnsonville, 80 6 Vicksburg.
 • Stoneville, 80 6 Vicksburg.

MISSOURI.

- 457 Ellis. 425 Montecerrat.
 369 Eilah. 398 Shabylville, Ok. Shelbyville.
 • Augusta, By mail, Labadie.
 • Purdin, 25 2 Unionville.

MONTANA.

- 957 Fallon. 957 Milton.
 957 Keith. 883 Silver Bow Juno. P. O.
 care Butte City.

NEBRASKA.

- 927 Atkinson. 922 Long Pine.
 • Benk'eman, (N. M.), 60 4 Plattsmouth.
 • Liberty, (N. M.), 35 2 Plattsmouth.

NEW BRUNSWICK.

- 3 Lake Ha Ha. 3 St. Louis.

NEW HAMPSHIRE.

- 20 Livermore.
 • Chesterfield, 25 0 by telephone, Brattleboro, Vt.
 • Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
 • North Hinsdale, 20 0 by telephone, Brattleboro, Vt.

NEW JERSEY.

- 41 Brick Church. Tariff. 41 Centerville, Passaic Co.
 same as Orange.

NEW MEXICO.

- 667 Gallup. P. O. care Win- 632 Monero.
 gate. 630 San Antonio.

NEW YORK.

- 64 Albion Station Oswego 83 Nichols.
 Co. Ok. Sand Bank. 51 Hochland.
 65 Apalachin. 65 Vestal.
 51 Fish's Eddy, Delaware Co. d
 • Minisink, Orange Co., 15 1 Fort Jervis.

NORTH CAROLINA.

- 173 Newton.
 • Falkland, (N. M.), 25 2 Tarboro.
 • Pactilus, (N. M.), 40 3 Tarboro.

OHIO.

- 221 Alvada. 221 McClure.
 180 Everett, Summit Co. 180 New Berlin, Stark Co.
 204 Hadley Junction. P. O. 169 Strasburg, Stark Co. P.
 Thurston, O. Maximo.
 221 Luckey. 213 Wheelersburg.
 • Hayville, Ashland Co., 15 1 by telephone, Ashland.
 • Monroe Centre, 20 2 No. Kingsville.
 • Pierpont, 25 2 No. Kingsville.

PENNSYLVANIA.

- 140 Corsica. 131 Stonerville.
 122 Elk Lick. 59 Virginville. Ok. Mose-
 151 Etna, Allegheny Co. lem.
 140 Evansburg, Butler Co. 151 Willow Grove, Allegheny
 P. O. Breakneck. Co.
 151 Fallston. 140 Zellenople.
 111 Houghbird. P. O. care
 Ouster City.
 • Academy Corners, 15 1 by telephone, Lawrenceville.
 • Cowanesque Valley, 20 1 by telephone, Lawrenceville.
 • Harrison Valley, 20 1 by telephone, Lawrenceville.
 • Harrison Valley Tannery, 20 1 by telephone, Lawrence-
 ville.
 • Nelson, 10 1 by telephone, Lawrenceville.

QUEBEC.

- Beauce Juno. Hu'te's Landing.
 Entia. St. Alphonse de la Grand
 Bois.

TENNESSEE.

- 292 Bellevue. 292 White Bluffs.

TEXAS.

The Squares omitted will be given in the next JOURNAL.

- Antelope (South). 555 Met's (South). P. O. care
 479 Bagwell's. Big Springs
 Boroch (South). San Martin (South).
 652 Bremen (South). P. O. 557 Sierra blanca (South). P.
 care Baird. O. care Loyah.
 Carlos Pass (South). 648 Trinity Mills
 485 Clear Creek. 470 Wayne.
 495 Cuero (South). 500 West.
 Wildhorse (South).

- Benavides, 25 2 Corpus Christi.
 • Kuntz, 35 2 Beaumont.
 • San Diego, 25 2 Corpus Christi.
 • Village, 40 2 Beaumont.

VERMONT.

- 39 South Wallingford.
 • E. Rupert, 15 2 Factory Point.
 • Guilford, 10 0 by telephone, Brattleboro.
 • Hartwellville, 20 1 by telephone, No. Adams, Mass.
 • Jacksonville, 15 2 by telephone, No. Adams, Mass.
 • North Stamford, 15 1 by telephone, No. Adams, Mass.
 • Readsboro, 20 1 by telephone, No. Adams, Mass.
 • Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
 • Sadauga, 25 2 by telephone, No. Adams, Mass.
 • Stamford, 15 1 by telephone, No. Adams, Mass.
 • Wells, 15 2 Factory Point.
 • West Dover, 25 0 by telephone, Brattleboro.
 • Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

- 153 Roanoke.
 • Lairds, (N. M.), 40 3 Richmond.

WISCONSIN.

- 852 Haywood. 308 Spring Meadow. P. O.
 839 Kempster. care Wauwatosa.
 855 Livermore. 852 Superior Juno.
 856 Livingston. 859 Summit Lake.

NORVIN GREEN,

President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
 WESTERN UNION TELEGRAPH COMPANY,
 New York, Dec. 29, 1881.

To all Transfer Agents and offices.

On January 16th, 1882, Streater, Ills., in Charles
 Catlin's District, will be advanced from Class C to
 Class B.

NORVIN GREEN,

President.

December 31st, 1881.

To Superintendents and Managers of the International
 Ocean Telegraph Company:

The International Ocean Telegraph Company
 having made the Western Union Telegraph Com-
 pany its agent for the management and operation
 of its property and business, and that company
 having undertaken such management and opera-
 tion from and after this date, you will report to
 and receive orders from the officers of that com-
 pany.

J. O. GREEN,

Vice President.

GOLD AND STOCK TELEGRAPH COMPANY,
 WESTERN UNION BUILDING,
 New York, December 31st, 1881.

To all agents of the Gold and Stock Telegraph Com-
 pany:

The property and business of this company
 having been turned over to the Western Union
 Telegraph Company, from and after this date you
 will report to and receive orders from the officers
 of that Company.

J. O. GREEN,

Vice President.

SITUATION WANTED BY A GOOD
 SOUND OPERATOR; understands Rail Road and Com-
 mercial Business.

G. RAY BAGG,
 Prospect, Oneida Co., New York.

WESTERN UNION TELEGRAPH COMPANY,
 New York, December 14, 1881.
 DIVIDEND No. 68.

The Board of Directors have declared a quarterly dividend
 of ONE AND ONE-HALF PER CENT. upon the capital stock of
 this company from the net revenues of the three months end-
 ing December 31st, instant, payable at the office of the
 Treasurer on and after the 15th day of January next, to share-
 holders of record on the 30th day of December, instant.
 The transfer books will be closed at three o'clock on the
 afternoon of the 30th of December, instant, and re-opened on
 the morning of the 17th of January next.

R. H. ROCHESTER,
 Treasurer.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
 With or without universal ankle motion. Remodeled, Im-
 proved and Warranted for Five Years. Prices Reduced. Send
 for Free Pamphlet.
 GEO. B. FULLER,
 Successor to Dr. D. Bly, Rochester, N. Y.

TELEGRAPH AND TELEPHONE

DEPARTMENT.

POST & COMPANY,

Cincinnati, Ohio

LICENSED MANUFACTURERS OF

NATIONAL

BELL TELEPHONE COS.

MACHINE & ELECTRO CALL BELLS, ETC.

Manufacturers of all kinds of Tele-
 phone Instruments, Bells, Flugs, Switch
 Boards, Annunciator Drops, Spring
 Jacks; Magneto-Engines for Switch
 Tables, and dealers in all kinds of Tele-
 phone Supplies and Tools, in stock and
 for sale at Lowest Prices.

Galvanized Line Wire, all numbers; Insulated Wire, all
 numbers. Insulators and Brackets, all sizes. Batteries, all
 kinds and sizes, at lowest prices.

FULL ASSORTMENT OF TELEGRAPH INSTRUMENTS.

Agents and Managers of Exchanges are requested to corre-
 spond with us before purchasing.

See We call Special attention to our New Improved Magneto
 Bells. Samples sent on application to agents and exchanges
 POST & CO., Cincinnati, Ohio.

THE
 BROOK'S PATENT INSULATORS

WERE AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1887
 At the Vienna Exposition, 1873
 At the Cincinnati Industrial Exposition in 1874
 And at the Centennial Exposition at Philadelphia in 1876.

MANUFACTURED AND FOR SALE BY

DAVID BROOKS,

29 South 31st Street, Philadelphia.

LITTLE GIANT
 FRENCH BATTERY

Relieves Rheumatism
 and all Nervous Com-
 plaints. Supersedes all
 others. Send for circular.
 C. E. JONES & BRO.
 Cincinnati, Ohio.

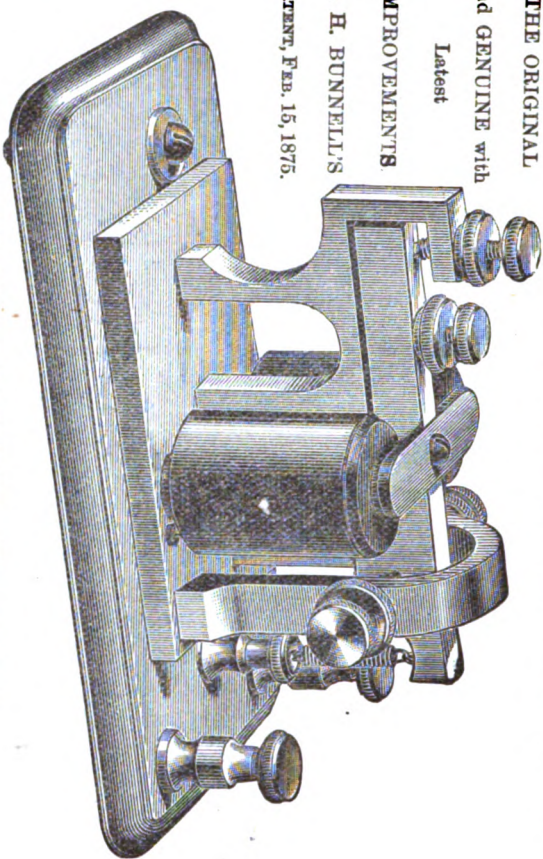
J. H. BUNNELL & CO.'S FIRST CLASS TELEGRAPH MACHINERY.

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS

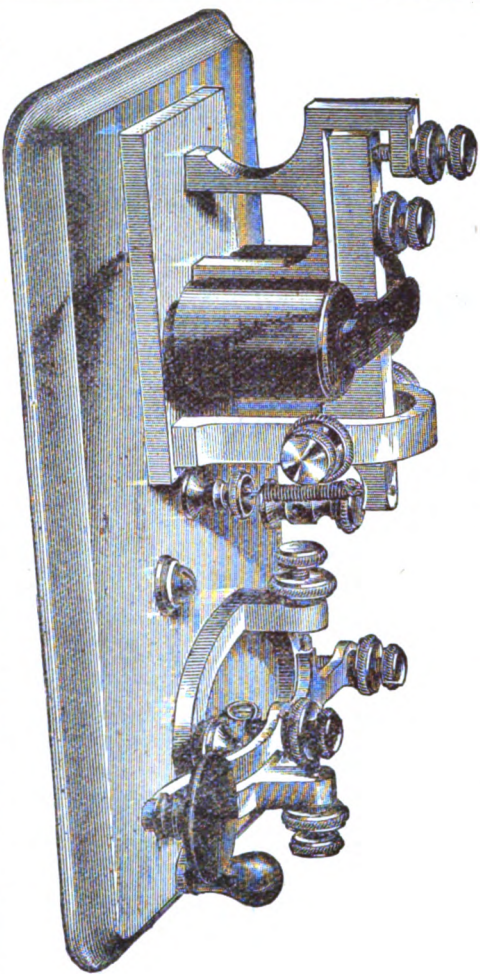
J. H. BUNNELL'S

PATENT, FEB. 15, 1875.



THE GIANT SOUNDER—UNEQUALLED!

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$5.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



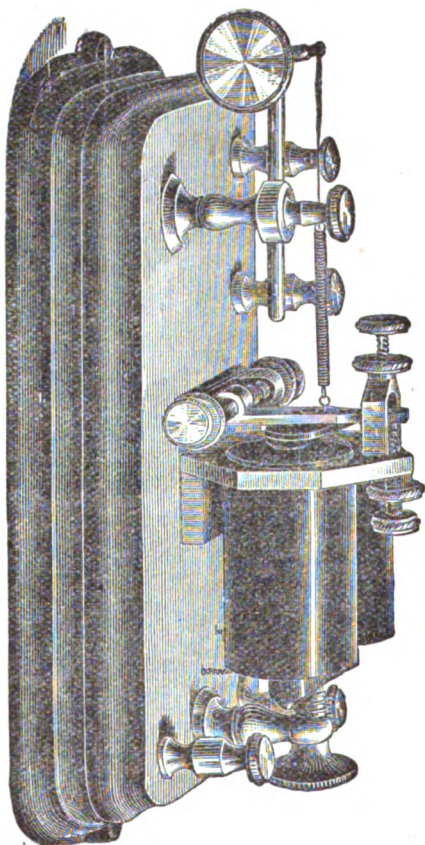
GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET:

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$8.00, carefully boxed and sent by mail, prepaid, to any part of the United States.

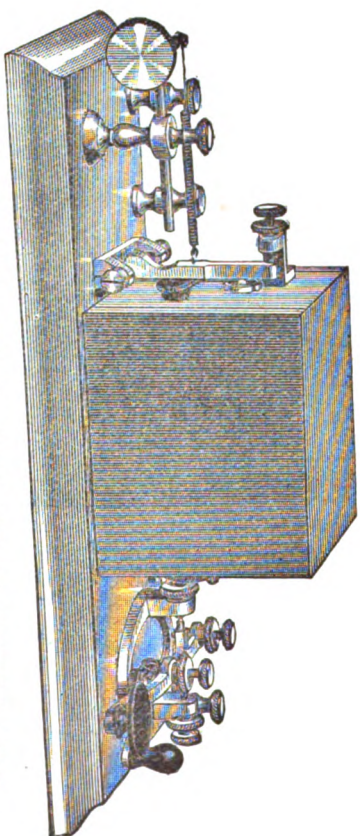
All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.



FIRST-CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Subbase, Extension Adjustment. Price, \$8.50.



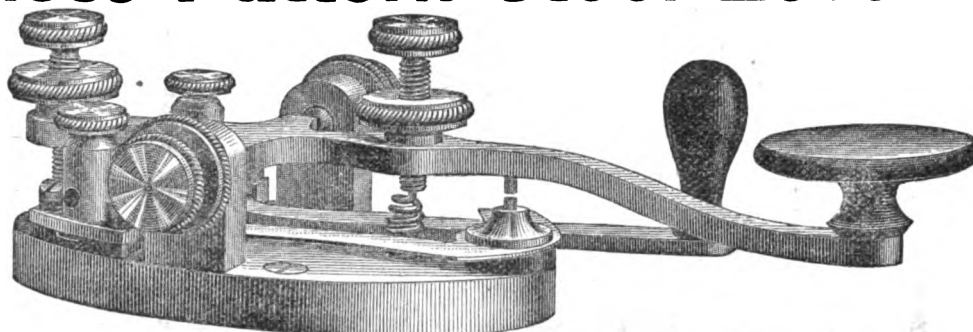
BOX SOUNDING RELAY AND STEEL LEVER KEY.

COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$12.00; without Key, \$9.00.

Send for estimates if you want low prices and first-class apparatus.

Legless Pattern Steel Lever Key.



A BEAUTIFUL AND PERFECT KEY,

Suitable for Use on Fine Desks or Wherever a Legless Key is Preferable.

PRICE, Carefully boxed, and sent, prepaid, by mail to any part of the United States, **\$4.00.**

THE AMERICAN UNION TELEGRAPH CO.

New York, Dec. 18th, 1880.

J. H. BUNNELL & Co.

Gentlemen—We have in use in this office, sixty-eight of your Steel Lever Keys.

The general verdict regarding them is, that **THEY ARE THE BEST EVER PUT ON A DESK.**

Yours truly,

WM. J. DEALY,

Manager Am. Union Co.'s (Main Office).

UNION PACIFIC RAILWAY CO. (Telegraph Dep't).

Omaha, Neb. January 15th, 1881.

J. H. BUNNELL & Co.

Dear Sirs—Your instruments meet with much favor on this company's lines and give good satisfaction. The Steel Lever Keys, especially, are much admired by the operators, who generally pronounce them the best. They at once combine strength and neatness, and are well adapted for easy and rapid sending.

Yours truly,

L. H. KORTY,

Chief Operator.

CONTINENTAL TELEGRAPH COMPANY.

New York, Dec. 14th, 1880.

J. H. BUNNELL & Co.

There is nothing that I can say that will be too strong in commendation of your New Steel Lever Key. Every one of our operators, without exception, regard it with decided favor, and I am now satisfied that its general use is not only a positive help to operators' efficient labors, but a decided advantage to the general service of the Company. We are using them in preference to all others.

Yours truly,

J. G. CASE,

City Manager Continental Tel. Co.

THE ATLANTIC AND PACIFIC TELEGRAPH CO.

New York, Dec. 16th, 1880.

J. H. BUNNELL & Co.,

We have six of your Patent Steel Lever Keys in use here in the principal Office of this Company. They give entire satisfaction in every way. We consider them a great improvement on the old style of telegraph key.

Yours truly,

P. P. HAUFF,

Manager Main Office, 145 Broadway, N. Y.

BALTIMORE AND OHIO RAILROAD CO.

(Tel. Dep't).

Baltimore, Dec. 28th, 1881.

J. H. BUNNELL & Co.

Gentlemen—I take pleasure in forwarding to you the accompanying testimonial voluntarily contributed by the operators in Camden Station Office, to the superior merits of your New Steel Lever Key.

Very truly yours,

CHAS. A. TINKER, Sup't.

BALTIMORE AND OHIO RAILROAD COMPANY.

(Telegraph Department.) December 27, 1880.

We, the undersigned operators at Camden Station, B. & O. R. R., Baltimore, having fully tested your "New Steel Lever Key," concur in saying, it is the best, without any exception, we have ever used.

Respectfully,

CHAS. P. ADAMS,

GEO. B. BUNTING, Jr.

E. J. LITTLE,

W. E. KING,

J. W. FERRY,

B. F. HARD,

A. D. FEASEL,

GEORGE BOGGS,

W. W. MOORE,

WM. A. LENZ,

J. F. McLAUGHLIN, J. W. STAYLOR,

H. P. BILSON.

And I endorse the above.

O. W. OLARVOE, Div. Operator.

From the winner of first prize in the fast sending tournament, New York, August 22, 1880, 500 words in 11 min. 14½ seconds.

"Cable Station No. Sydney, C. B.,"

Dec. 26, 1880.

Prefer it to any other key I have ever used. It is the general opinion of operators here that the Steel Lever Key is the best they have ever seen.

W. J. CURTIS.

"Your Steel Lever Key proves to be one of the best improvements ever introduced in Telegraphic Apparatus.

J. H. LOUNSBURY,

Manager Am. Union Telegraph, Hartford, Conn.

All our best senders who have tried it here, praise it highly and pronounce it "fast."

R. J. WYNNE,

W. U. Telegraph, Washington, D. C.

THE FOLLOWING EXPRESSIONS OF OPINION ARE ALL FROM THE WESTERN UNION MAIN OFFICE, 197 BROADWAY, NEW YORK.

We have your keys on the Chicago, St. Louis and Buffalo Quads, Western, Eastern and State Press, and C. N. D. Circuits. Without a single exception, the operators regard them as the very best.

FRED. OATLIN.

Best I ever used.

FRANK VILES.

Consider your Key far superior to any I have yet handled.

J. E. SAYRES, Cincinnati Quad.

Having worked your Key on Chicago Quad for the past month, can cheerfully say it is the best Telegraph Key I have ever used.

CHAS. F. HUTCHINSON.

Far superior to any other Key,

COURT M. CUNNINGHAM.

Requires less labor, is capable of greater speed, and sends finer and firmer Morse than any heretofore in use.

J. A. WRIGHT, Jr. D. B. CASE,

RICHMOND SMITH, E. F. HOWELL.

Like the Key very much. It makes sending easy.

T. H. ALLEN, New Orleans Duplex.

Your Key is without doubt, the best in the world. It is simply perfection.

J. B. COULTER.

Our only desire is to have one of your Keys put on the Pittsburg Quad. Eitymiller works on the Pittsburg end.

DENNIS BROWN and M. DURIVAN.

Your Key, is, in my opinion, unequalled.

MINER M. DAVIS, Philadelphia Quad.

The finest in the world.

J. B. TALTAVAL, J. H. YOUNG,

St. Louis Quad.

Best I have ever used.

CHAS. H. MILLER, State Press.

Prefer it to any I have ever used.

CHAS. W. MINIER.

The best Telegraph Key we ever handled.

W. D. CHANDLER, } Chicago Quad.
M. LABAUGH, }

There is but one perfect Key, and this is it.

W. O. ATKINSON, Baltimore Quad.

FULL LINE OF FIRST CLASS SOUNDERS, KEYS, RELAYS AND TELEGRAPH EQUIPMENTS OF EVERY DESCRIPTION. SEND FOR CATALOGUE FREE.

J. H. BUNNELL & CO., 112 LIBERTY STREET, NEW YORK.

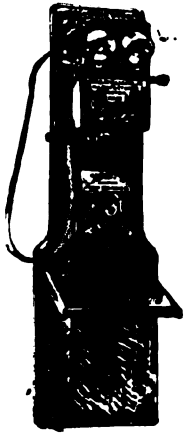
CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells,
District Bells and Switches for Exchanges, Annunciators, etc

TELEGRAPH & ELECTRICAL INSTRUMENTS,

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

GEO WESTINGHOUSE, JR. Pres. RAPHE BAGLEY, V. Pres. & Treas.
O. H. JACKSON, Gen'l Manager. ASAPH T. ROWAND, Secretary.
HENRY SNYDER, General Agent,

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of
The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
Sole Owners and Manufacturers of the only practically successful

SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Electricity.

Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.

Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnished
upon application.

The Fitch Chlorine Battery,

Patented Sept. 18, 1879.

The Cheapest, Cleanest, most Economical, Durable, and decidedly the
BEST OPEN CIRCUIT BATTERY

in use for Telephones, Annunciators, and Electric Bells. After several years of constant use, it is pronounced to-day as being Far Superior in constancy and power To all other Batteries, for the above purposes, notwithstanding all statements to the contrary. We have made several valuable improvements in this Battery, among which is the substitution of a noncorrosive and adjustable clamp, in place of the old style lead cap, which warrants us in saying that

THE CHLORINE BATTERY has no equal in the market, and all we ask is a trial.

Price, \$1.50 per Cell.

LIBERAL DISCOUNT TO THE TRADE.

PARTRICK & CARTER,

Sole Agents & Manufacturers,

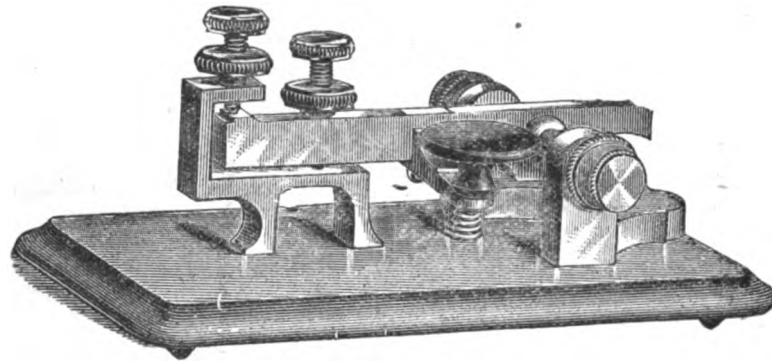
114 South Second St., Philadelphia, Pa.



NEW MECHANICAL

TELEGRAPH INSTRUMENT.

PATENT APPLIED FOR.



COMBINED KEY AND SOUNDER.

No BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is *always ready for use.*

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or registered letter.

J. H. BUNNELL & CO.,

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

ILLUSTRATED CATALOGUES

OF NOVEMBER, 1881?

If not, send your address by postal card or letter and you will get one by return mail

IT CONTAINS

Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instruments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

Don't Read This, or you will be sure and send for our proper and to your interest to do before purchasing elsewhere. If you want to become a Telegraph Operator send twenty-five cents for our new 1882 Illustrated Instruction Book. It is the most complete instruction book published in the world.

C. E. JONES & BRO.,

Manufacturers and Dealers in Telegraph, Telephone and Electrical Supplies.

51 WEST FOURTH STREET, CINCINNATI, OHIO.

WESTERN ELECTRIC MANUFACTURING COMPANY.

230-232 KINGS STREET, CHICAGO.

62-68 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES.

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone-Exchange Apparatus, Underground Cables.

AMSON STAGER, President. ERIC M. BARTON, V.-Pres.

HELENA GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE. |
|---|--------|--------|
| I—Complete Set of Catalogues..... | 296 | 20c. |
| II—Telegraph Instruments and Supplies..... | 64 | 6c. |
| IV—Insulated Wire (included in II). | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 32 | 2c. |
| VI—Electro-Medical Apparatus..... | 32 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 32 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 2c. |
| XI—Magnets for Mills..... | 20 | 2c. |
| Str Wm. Thomson's Nautical Instruments... | 24 | 2c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,

AND

PLAIN AND OILED WIRE OF SUPERIOR QUALITY,

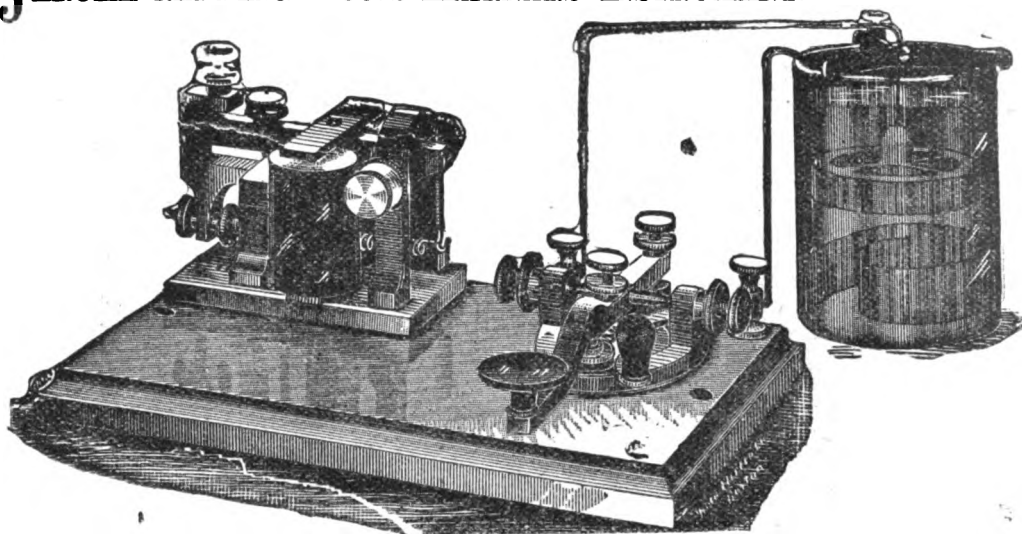
FROM SWEDISH CHARCOAL AND B B IRON.

SUT ONE JOINT PER BUNDLE.

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



PRICE FOR THE COMPLETE "GEM" LEARNERS' OUTFIT, \$4.20.

Consisting of the above large-sized Sounder and Key, a good Cell of Calland Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument made that has nicely finished brass Sounder and Key Levers with perfect adjustments for both.*

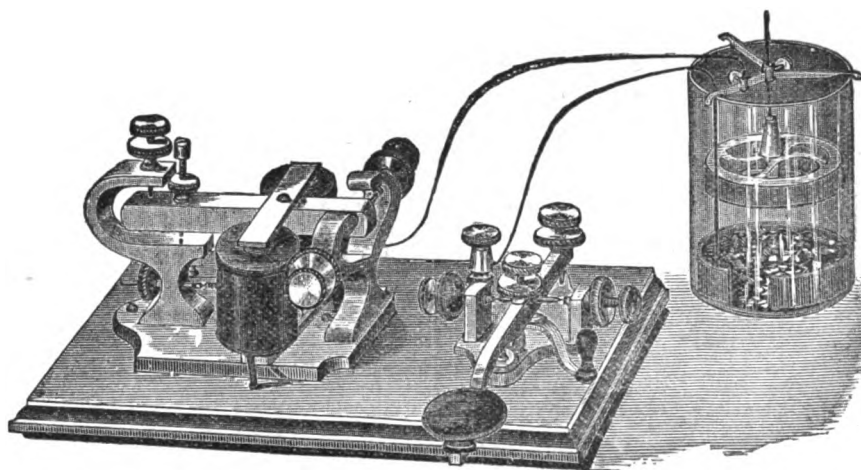
| | | | |
|---|--------|---|--------|
| PRICE for Complete Outfit..... | \$4.20 | PRICE for Instrument alone, for lines 1 to 15 miles.. | \$4.00 |
| " " Instrument alone | 3.40 | " " " " " " " " | |
| " " Instrument alone, by mail, postpaid ... | 4.00 | by mail, postpaid..... | 4.80 |

SEND FOR CIRCULAR.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,

No. 80 HANOVER STREET, BOSTON, MASS.



No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of Sounder, Key, either on 1 base or separate, 5x7, Calland Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent O. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

A. B. LYMAN, 36 South Water St., Cleveland, O.

PARTRICK & CARTER

TELEGRAPHIC SPECIALTIES.

THE GIANT SOUNDER PERFECTED.

Patented Feb. 16, 1875. Most perfect, reliable, clear toned; fine finish, and warranted the best working sounder in existence. Price, by mail, \$5.00.

THE "LATTIG" AUXILIARY LEVER NON-STICKING KEY.

PATENTED AUGUST 16, 1881. PRICE, \$5.00, BY MAIL.

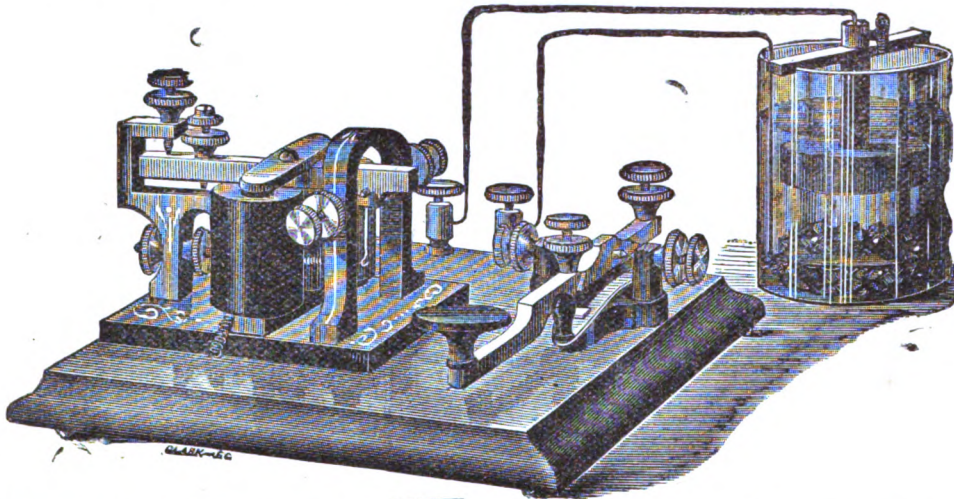
This Key is very fine finish nickel-plated, and presents a beautiful appearance, is easy to handle and WARRANTED NEVER TO STICK. It has been extensively tried and has received the endorsement of the best operators in the country. It embodies the only true principle to prevent a Key from sticking by having a great separation between the anvil and hammer, (without increasing the play of the Key lever,) thereby preventing the formation of the "Electrical Arc" between the platina points, which is the PRIMARY CAUSE OF STICKING KEYS. We claim this Key will never fail to make contact.

"THE EXCELSIOR KEY." (PATENT APPLIED FOR.) PRICE \$2.50 BY MAIL.

This Key is made ENTIRELY OF BRASS NICKEL PLATED, with hardened platina points, and it is put forward to meet the long existing demand for a CHEAP, LIGHT, EASY WORKING, FIRST CLASS KEY, and is without doubt the CHEAPEST and BEST KEY EVER OFFERED FOR THE MONEY.

Premium Learners' Apparatus.

Only \$5.00. Not the Cheapest, but Guaranteed the Best.



The PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER, PERFECTED," and "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Callaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5.00, when the money accompanies the order. The great number of these Instruments use is the best testimonial that can be offered.

Price, Complete Outfit Money in advance, \$5.00
 " Instrument without Battery " " 4.20
 " Instrument without Battery, by Mail " " 4.75

Remittances should be made by P. O. Money Order, Registered Letter, Draft or Express, which will insure safe delivery. Send for circulars.

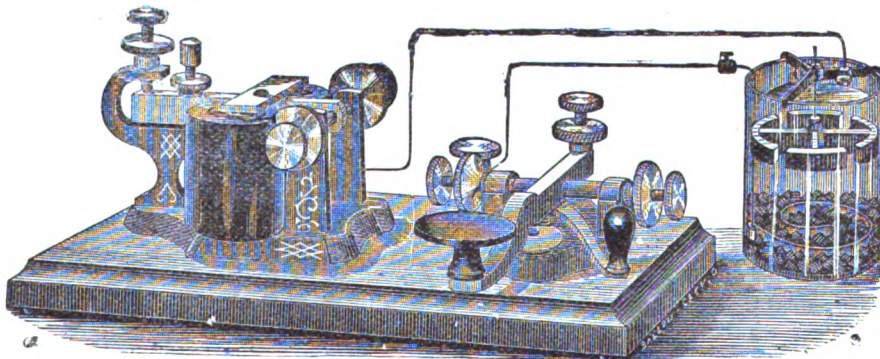
PARTRICK & CARTER,

No. 114 SOUTH SECOND STREET, PHILADELPHIA, PA.,

Manufacturers and Dealers in TELEGRAPH, TELEPHONE, AND ELECTRICAL INSTRUMENTS AND SUPPLIES OF EVERY DESCRIPTION. Send for Catalogues and Circulars.

SEND FOR OUR PRICES BEFORE PURCHASING ELSEWHERE.

EUREKA OUTFIT NO. 2.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

THE ABOVE OUTFIT AND MATERIAL ALL COMPLETE SENT ON RECEIPT OF \$4.25.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

Room 19, Leader Building, Cleveland,

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

2,156 MEMBERS.

\$21,000 RESERVE FUND.

The Association respectfully invites attention to its success during the past ten years, having paid to its beneficiaries over \$160,000, and accumulated a reserve fund of \$21,000, interest upon which nearly pays current annual expenses. No officer or agent draws salary or commission. Average annual assessments to each member has been less than \$12.

Any person, of either sex, in good health of not less than 18 or more than 45 years of age, who is employed in telegraphic service, and is otherwise qualified as required by the By-Laws, is eligible to membership; and should a member in good standing leave the Telegraphic Service, but continue to pay all dues assessed and otherwise conform to the Constitution and By-Laws, he can retain his membership.

The initiation fee is \$2. \$1,000 will be paid to the Beneficiary of a deceased member within 60 days after verification of claim; and in the case of a member who has been one year, — next preceding date of death — in good standing, the claim is indisputable.

Any one who is or becomes a member in good standing of this Association is also eligible to membership in the new or Second Division. For further information, copies of Constitution and By-Laws, blank applications, etc., apply to any of the following named officers or agents:

OFFICERS:

CLARENCE GARY, President. O. H. SUMMERS, Vice-President.
 A. R. BREWER, Secretary. SAMUEL M. TAYLOR, Treasurer.

EXECUTIVE COMMITTEE:

CLARENCE GARY, New York. O. H. SUMMERS, Chicago, Ill.
 A. R. BREWER, New York. SAMUEL M. TAYLOR, New York.
 W. H. YOUNG, Washington. D. C. F. W. JONES, New York.
 JOHN E. ZEUBLIN, Phil. Pa. CHARLES S. H. SMALL, New York.
 JAMES MERRIHEW, New York.

AUDITING COMMITTEE:

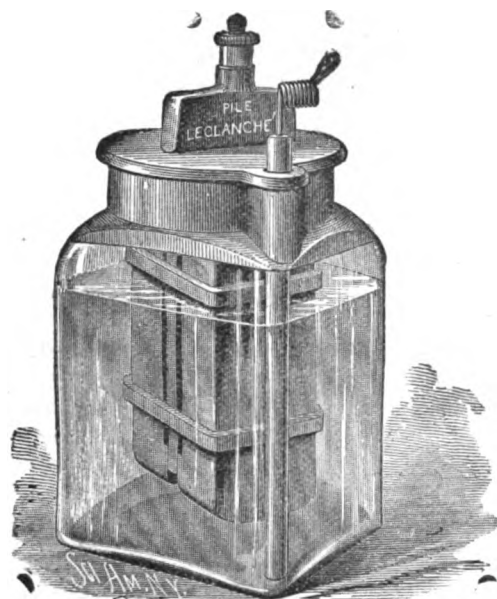
H. O. ROBINSON, Philadelphia, Pa. T. F. SOULLY, New York.
 B. W. POPE, New York.

AGENTS:

| | |
|---|--------------------------|
| Albany, N. Y. | Charles C. King. |
| Augusta, Ga. | John W. Brown. |
| Atlanta, Ga. | J. M. Stephens. |
| Baltimore, Md. | R. J. Bloxham. |
| Bangor, Me. | H. O. Bliss. |
| Bismarck, Dak. | E. C. Greene. |
| Boston, Mass. | E. B. Piusbury. |
| Buffalo, N. Y. | J. W. Tillinghast. |
| Cheyenne, Wyo. Ter. | Chas. F. Annett. |
| Cincinnati, Ohio. | F. A. Armstrong. |
| Chattanooga, Tenn. | Charles H. Skelton. |
| Charleston, S. C. | J. D. Easterlin. |
| Chicago, Ill. | J. Uhrig. |
| Cleveland, Ohio. | H. L. Melton. |
| Columbus, Ohio. | C. W. Ross. |
| Dennison, Ohio. | G. L. Lang. |
| Denver, Col. | W. B. Rundle. |
| Dubuque, Iowa. | F. I. Benson. |
| Detroit, Mich. | T. W. Hill. |
| Elkhart, Ind. | S. P. Wilcox. |
| Evansville, Ind. | N. M. Booth. |
| Grand Rapids, Mich. | E. D. Benedict. |
| Galveston, Texas. | David Hall. |
| Grafton, W. Va. | A. T. Oline. |
| Harrisburg, Pa. | H. A. Oline. |
| Halifax, N. S. | Alex E. Hoyt. |
| Hartford, Conn. | S. B. Curtis. |
| Indianapolis, Ind. | F. A. Moore. |
| Jackson, Mich. | D. S. Fleming. |
| Jackson, Tenn. | Nelson E. Jacobs. |
| Kansas City, Mo. | M. D. Wood. |
| La Fayette, Ind. | H. E. Doolittle. |
| Little Rock, Ark. | E. C. Newton. |
| Louisville, Ky. | Charles Smith. |
| Minneapolis, Minn. | Day E. Smith (St. Paul). |
| Mobile, Ala. | B. P. Shreve. |
| Montgomery, Ala. | E. Winter. |
| Memphis, Tenn. | C. O. Beally. |
| Milwaukee, Wis. | D. H. Henshaw. |
| Montreal, Quebec. | James Kent. |
| Nashville, Tenn. | A. H. Stewart. |
| New Haven, Conn. | J. M. Fairchild. |
| New Orleans, La. | J. T. Allyn. |
| No. Sydney, C. B. | Nath'l Martell. |
| New London, Conn. | G. W. Russell. |
| N. Y., L. Erie & W. R.R. (21 Cortlandt St. N. Y.) | C. D. Reed. |
| Oil City, Pa. | Frank Ross. |
| Omaha, Neb. | L. M. Rheem. |
| Philadelphia, Pa. | Wm. G. Jones. |
| Phillipsburgh, N. J. | G. H. Grace. |
| Peoria, Ill. | J. E. Banney. |
| Pensacola, Fla. | O. L. Le Baron. |
| Pittsburgh, Pa. | Samuel A. Duncan. |
| Poughkeepsie, N. Y. | S. K. Ruple. |
| Portland, Me. | C. D. Livermore. |
| Portland, Oregon. | D. F. Leahy. |
| Providence, R. I. | Edgar M. Dexter. |
| Reading, Pa. | W. H. Runyon. |
| Richmond, Va. | W. C. Walstrum. |
| Rochester, N. Y. | A. J. Stoddard. |
| Reno, Nevada. | Frank Bell. |
| Sayre, Pa. | H. H. Hamilton. |
| Scranton, Pa. | B. O'Brien. |
| Syracuse, N. Y. | Luther G. Field. |
| St. John, N. B. | B. T. Clinch. |
| St. Louis, Mo. | W. H. Stanton. |
| St. Paul, Minn. | Day E. Smith. |
| San Francisco, Cal. | A. P. Dubois. |
| Savannah, Ga. | H. Griffith. |
| Springfield, Mass. | W. J. Denver. |
| Springfield, Ill. | W. W. Kelchne. |
| Toronto, Ont. | J. Lanskill. |
| Troy, N. Y. | F. D. Adams. |
| Toledo, Ohio. | J. P. Church. |
| Vincennes, Ind. | Perry Hood. |
| Washington, D. C. | W. H. Young. |
| White River Junction, Vt. | G. W. Gates. |
| Wellsville, Ohio. | F. Bruner. |
| Worcester, Mass. | E. W. Bradford. |
| Watertown, N. Y. | D. Van Nostrand. |

A. R. BREWER, Sec'y and General Agent,
 P. O. Box 3175. NEW YORK.

W. U. T. BUILDING, Room 53.

LECLANCHE BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company,
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones.

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Plaques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of Infringements and Wasteful Imitations.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity Zinc and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,

40 West 18th St., New York.

Or **L. G. TILLOTSON & CO.,**

5 & 7 Dry Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURED ON PATENT PRISMED

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLES, ETC.

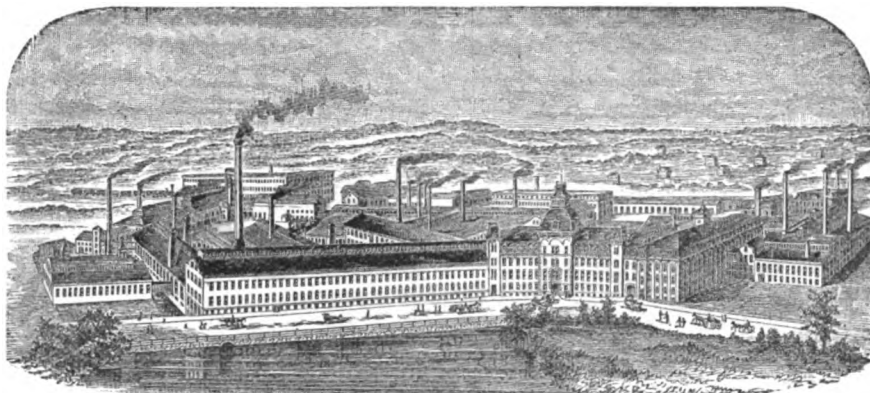
OFFICE AND FACTORY: 67 STEWART STREET.

PROVIDENCE, R. I.

W. H. SAWYER, Electrician and Sup'l.

TELEGRAPH WIRE.**TELEPHONE WIRE.****WASHBURN & MOEN MANUFACTURING COMPANY.**

INCORPORATED 1861. CAPITAL \$1,500,000.



WORCESTER, MASS.

21 OLIVER STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to *highest electric conductivity*, does not hesitate to recommend this class of its products as unequaled in that particular.

Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

(In connection with the DOUBLE SHEET FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

KERITE INSULATED TELEGRAPH WIRES AND CABLES

KERITE IS INDESTRUCTIBLE.

**FIVE YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.**

IT LASTS FOR YEARS

in earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession

**THE
DURABLE QUALITIES OF KERITE**

RECORDED IN AS THE

CHEAPEST AND MOST ECONOMICAL

insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation furnished at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

S. HITCHCOCK, General Agent.

THE AMERICAN BELL TELEPHONE COMPANY.

W. H. FORBES, President, W. K. DRIVER, Treasurer,

THEO. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telephone Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

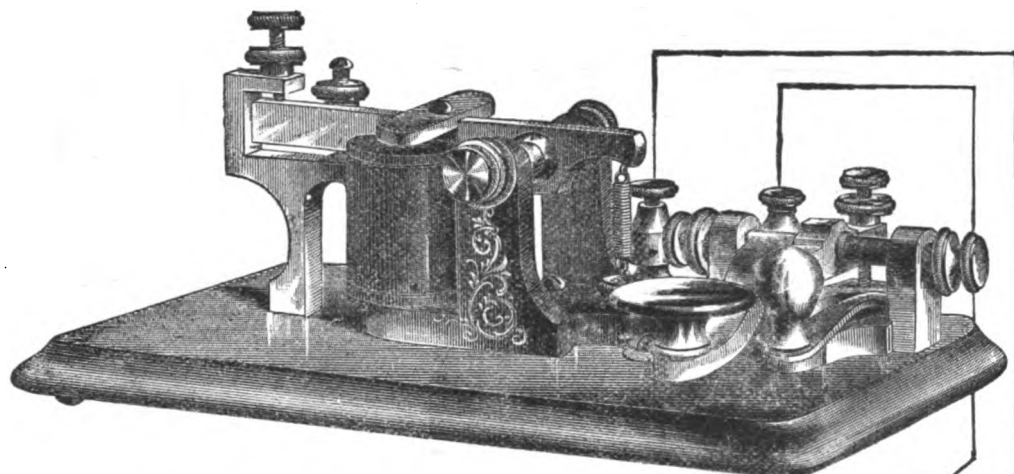
This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

**No. 95 MILK STREET,
BOSTON, MASS.**

All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

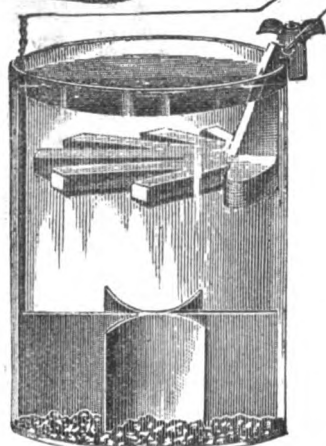
The "Morse" Learners' Instrument.



THE BEST.

Price, \$450, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.
 "Morse" instrument alone, without battery..... \$3.80
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 4.50
 Cell of battery complete..... .65
 "Morse" Learners' Instrument, without battery, sent by mail..... 4.30
 (Battery cannot be sent by mail.)

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.
 Remit by Draft, Postal Money Order, or Registered Letter.
 Favorable arrangements made with Agents everywhere.



THE BEST.

THE "MORSE"

Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners' Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

You are **SURE** of getting
THE BEST THAT IS MADE

IF YOU SELECT THE "MORSE."

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.

ESTABLISHED 1830.

ALFRED F. MOORE,

(Successor of JOSEPH MOORE & SONS)

MANUFACTURER OF

INSULATED TELEGRAPH WIRES,

200 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

INSTRUMENT AND OFFICE WIRES. FLEXIBLE CORDS. ANNUNCIATOR
 AND BUREAU ALARM WIRE. RELAYING CABLES.

All wire used is thoroughly tested for conductivity, therefore ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP,

FOR FLEXIBLE CORDS.

Descriptive Circulars furnished upon application.



CARDS! CARDS!!

Your name finely printed on 15 Bevel Gold-edge Cards, with or without a small Key or Pigeon Embellishment engraved on the upper turn-down corner, for 25 c.; or, 75 with address, if desired, for \$1.00; or 25 assorted Electrotype Cards of Keys, Sounders, Relays, &c., for 30 c. 25 Embellished Keys, 30 c. 25 Transparent Picture Cards, new and rich, 20 c. 25 Tinted Portraits of Actresses, (Bernhardt, &c.), no name, 20 c. 25 side-splitting Comedies, no name, 20 c. 25 laughable Faritation Cards, 20 c. One Russia Card Case, two pockets, 20 c.; Morocco, 10 c. Samples of Cards, 10 c. We have the Bevel Gold-edged Cards, engravings for nearly all kinds of business. You can make money by selling them in your town, as all business men will appreciate them. Samples and terms, 10 c. Silver wrapped in paper comes safely. Address

F. P. MUNN, CLYDE, Wayne Co., N. Y.

HARD RUBBER TELEGRAPH AND RAILWAY SUPPLIES.

Office of the INDIA RUBBER COMB CO.,

Nos. 9, 11 & 13 MERCER ST., NEW YORK.

All communications should be addressed to P. O. Box 514.

With increased facilities in our

SUNDRY DEPARTMENT

we are prepared to give lowest estimates on any article which can be manufactured to advantage out of

HARD RUBBER,

and which is adapted to the

TELEGRAPH & RAILWAY SUPPLY

ade.

All communications and orders will be promptly and carefully attended to.

THE INDIA RUBBER COMB CO.

BEST TELEPHONE EXCHANGE SWITCH BOARD.

IN THE WORLD.

SUPERSEDING ALL OTHERS.

Sample and Circulars sent to Exchanges on

Application to

C. E. JONES & BRO.,
 CINCINNATI, OHIO.

WESTERN SCHOOL OF TELEGRAPHY.

JANESVILLE, WISCONSIN.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement, now of five years standing, with the system of city lines in Chicago known as the Metropolitan Telegraph Company, having over 100 offices, and worked in connection with lines to all parts of the country. These city lines draw their operators from this school, placing them first in sending offices and afterwards promoting them according to merit. The superintendents of telegraph of the different railroads centering at Chicago, employ many men from the city lines, and the leading telegraph companies do the same, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make of our students first class operators, nor to obtain for them first class situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

RICHARD VALENTINE, } MANAGER.
 A. M. VALENTINE, }

N. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have lately furnished the following Companies in this way, to whom we refer: Wisconsin Central, Green Bay & Minn.; St. Paul, Minneapolis, & Manitoba & Chicago; St. Paul, M. & Omaha,

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, JANUARY 16, 1882.

WHOLE NO. 341.

THE SCIENTIFIC PRINCIPLES INVOLVED IN ELECTRIC LIGHTING.

By PROF. W. GYLLS ADAMS, F.R.S.

A series of "Cantor Lectures" delivered before the Society of Arts, London, 1881.

(Concluded from page 3)

A small Gramme machine of the A type, having an internal resistance of 4.58 ohms, and with an external resistance of 4 ohms, gives an electric current of 17.5 webers and an electro-motive force of 158.5 volts, giving an amount of work equivalent to 2 h.p., $EQ = 160 \times 17$ nearly = 8 times the energy of 40 cells of Grove.

If we wished to replace such a machine by Grove's cells, we should have to arrange about 80 cells to get the same electro-motive force, and to make each cell about four times as large, or to arrange 320 cells in four sets of 80 in each set, to get the same amount of external work done as by the Gramme machine. This will show how impossible it is to do the work by voltaic batteries which can be done by magneto-electric machines.

The equation, $\text{work} = EQ$, may be satisfied in two ways—either by making Q large and E small, i. e., making what is called a quantity machine which will only do effective work when the external resistance is small; or we may make Q small and E large, i. e., what is called a tension machine, which requires an external resistance large enough to prevent the machine from being overheated, and to satisfy the relation for the greatest amount of external effective work.

COMPARISON OF TWO GRAMME MACHINES.

| | Quantity. | Tension. |
|------------------------------------|-----------|----------|
| Number of turns per minute..... | 797 | 967 |
| Internal resistance..... | 1.2 | 4.58 |
| External resistance..... | 1.14 | 4.00 |
| Current in webers..... | 29.67 | 17.51 |
| Electro motive force in volts..... | 81.58 | 158.50 |
| Work spent to produce current.... | 243 | 277 |

Thus we see that the total amount of energy is nearly the same in the two cases, but in one case it is spent in driving a large current through a small resistance, and in the other a smaller current is sent through nearly four times the resistance, and to do this a higher electro-motive force is required. This higher electro-motive force is obtained by increasing the number of turns of wire in the bobbin and in the magnet, so strengthening the magnetic field, and also by increasing the number of turns of the machine.

We arrive, then, at the conclusion that, to overcome higher resistances more effectually, higher electro-motive force, and therefore higher speed, is required. Now our resistances may be so high that an ordinary current of electricity, even from a dynamo-machine, will not pass through it, in which case we have to resort to another method of producing electricity, of still higher electro-motive force, but the quantity produced is then consider-

ably diminished. We have then to take an induction coil, consisting of two coils, in one of which a current of electricity from a battery is passing, and by suddenly breaking and making this current, to obtain great changes of the magnetic field, and hence great electro-motive forces, and so get very powerful alternating currents. We know the effect of checking suddenly the flow of water in a pipe. Sometimes the increase of pressure so produced may be sufficient to burst the pipe, and this is one transformation of the energy of motion of the water. This is analogous to the development of the energy of the induction current by the sudden checking of the electric current in the primary circuit. Water may be raised to a high level by a series of sudden impulses, as in the hydraulic ram. A flow of a considerable quantity of water being suddenly stopped, there is at once a sudden increase of pressure, which is sufficient to lift a valve, and allow a small quantity of water to pass into the reservoir or air-chamber. This air-chamber regulates the action of the flow of water up the pipe from the reservoir, just as the resistance and capacity of the secondary circuit regulate the secondary induction current when the primary current is broken. The action of the induction coil is very well illustrated by the action of the hydraulic ram, the level to which water is raised corresponding to the electro-motive force of the secondary circuit. Just as in the hydraulic ram, the quantity of water raised by the machine is at the best only about 66 per cent. of the quantity used, so in making use of the induction current to do work, or to produce the electric light, it is impossible to convert more than a fraction of the energy of the original current into useful work.

In the two systems of electric lighting to which I wish to draw special attention this evening, we have instances of the two opposite methods of accomplishing the same end, viz., the lighting of moderate-sized rooms by a steady and pleasant light.

THE WERDERMANN OR JOEL ELECTRIC LIGHT.

In the Werdermann system, or the Reynier system, a small thread or point of carbon abuts against a plate or edge of carbon or of copper, and becomes heated by the current so as to give out a glowing light, and gradually consumes away, but more and more slowly as the carbons are more and more improved. In these lamps, kindly lent to me by Mr. Latimer Clark, and in these Joel lamps, kindly lent to me by Mr. Joel, who has introduced several improvements into the original Werdermann lamp, the resistance of the contact of carbon is very small, about .134 of an ohm; hence it will take several of them, 7 or 8 (or perhaps 10), arranged in series in the same circuit, to equal the resistance of the electric arc. To work these lamps of low resistance only a low electro-motive force is required, and so the result is attained by driving a small resistance dynamo-electric machine at mode-

ately low speed; or by placing a considerable number of lamps in series, so as to make their combined resistance equal to or greater than the internal resistance of the machine. Thus a Gramme machine, revolving at the rate of 1200 revolutions a minute, giving an electro-motive force of about 130 volts, will give a current of 50 webers through about 10 lamps in series. But this current gives an illumination of 320 candles in each lamp, so that with this current we get an illumination of 3200 candles in 10 lights. Now, the energy expended to produce this rate of revolution in a Gramme machine is about 9 or 10 h.p. Hence the Werdermann, or the Joel lamp, gives at least two lights of 160 candles each for each h.p. of energy expended.

Mr. Alex. Siemens lays down, in his paper on "Electric Lighting," that 4 lbs. of coal, costing 15s. a ton, will produce 1 h.p. of energy per hour, and that, if a steam-engine be employed to produce an electric light of 6000-candles power, the cost would be 5d. per hour. If the same illumination be produced by 15 lights of 400 candles each, the cost would be 2s. 1d., or five times as much. Hence the cost for a 400-candle light would be at the rate of about 1½d. per hour.

Now, by comparison, we may get some idea of the price of the electric light when obtained by means of the Werdermann or Joel lamp. If we compare the light obtained by the Joel or Werdermann lamp with that from the 400-candle light from the arc, we get about 320—or, say, 300—candle power in the Joel light for 800-candle power in the other. Hence the price of the electric light from a Joel lamp should be at the rate of 6½d. per hour for a 600-candle power light.

Now, according to Mr. Alex. Siemens' estimate for gas, the price of gas would be at the rate of 5 4-5d.,—or nearly 6d.—per hour for the same light. In other words, the cost of the electric light from the Joel lamp would be nearly the same as gas at the rate of 4s. per 1000 cubic feet.

In estimating the candle power of lamps it is usual to place the photometer on the same level with the lamp, so that the surface is illuminated by the rays proceeding horizontally from the lamp. Now, in all lamps, whether Werdermann or arc lights, which are fed by a continuous current machine, the current passes from the positive carbon to the negative always in the same direction; and in the arc lights, the upper positive carbon becomes worn away into a hollow; hence a portion of this carbon obstructs the light, and the greatest intensity of light is not in a horizontal direction, but downwards, at an angle of about 60° below the horizontal. The illumination in this direction is about three times—or even more than three times—the illumination in the same horizontal plane with the arc; hence, when it is said, in the report of the Glasgow tests, that a dynamo-machine, at 1200 revolutions per minute, will give a light of 2060 candles,

for an expenditure of 4 h.p.—the light being measured horizontally—we see that the illumination, in a direction inclined downwards at an angle of 60° below the horizon, would be 6500 candles for 4 h.p. or at least 1625 candles per h.p. This will also explain why lights fed from continuous current machines should be placed at a considerable height above the area to be illuminated. This, combined with the fact that it is far more economical to produce one very powerful light by means of a large machine than several smaller lights to illuminate the same area to the same degree, will explain why Dr. Siemens is erecting his large lamps at so great a height for the trials of electric lights which we shall shortly have an opportunity of seeing in the city.

SUB-DIVISION OF THE ELECTRIC CURRENT.

The next point to which I propose to draw your attention this evening is the sub-division of the electric current.

It will be simplest to regard first the case where there is a battery of given electro-motive force. In this case, according to Ohm's law,

$$E = C(R + r),$$

where E is the electro-motive force, C the current, R the resistance of the battery, and r the external resistance. If the poles of the battery be joined by two separate resistances, r and r^2 ,

$$\text{then } E = C \left(R + \frac{r_1 r_2}{r_1 + r_2} \right)$$

If the resistance of each branch is equal to r , and if C_1 be the current in each,

$$\text{then } E = C(R + r) = 2 C_1 \left(R + \frac{r}{2} \right).$$

Let $E = 100$ volts, $R = 1$ ohm, and $r = 100$ ohms,

$$\text{then } 100 = C(1 + 100) = 101 C,$$

$$\text{and } 101 = 2 C_1(1 + 50) = 102 C_1.$$

Hence nearly the same current flows in each branch as when there is only one wire. If there are 10 branches instead of 2 branches, and if C_x be the current in each,

$$\text{then } 100 = C_x(1 + 10) = 110 C_x,$$

i.e., the current in each branch is 100/110 instead of 100/102. If there are 50 branches, and C_y be the current in each,

$$\text{then } 100 = C_y(1 + 2) = 150 C_y,$$

thus the current in each is 100/150 or 2/3, and the heating or glowing effect is 4/9 of its value with only one branch.

Now, if with 50 branches in multiple arc, we diminish the external resistance of each branch so as to get the same current as at first through each branch,

$$\text{then } E = C(R + r) \text{ at first,}$$

$$\text{and } E = 50 C \left(R + \frac{r^1}{50} \right) \text{ with 50 branches.}$$

$$\text{So that } (R + r) = 50 R + r^1,$$

$$\text{Or } r - r^1 = 49 R.$$

Hence with $R = 1$ and $r = 100$ ohms $r - r^1 = 49$ and the length left has a resistance of 51 ohms, the heating of each of these is 51/100, or one-half of what it was with only one branch. Hence the glowing heat or light from such a resistance will be greater than from the unshortened wire, with the weaker current through it. In this case we get 50 circuits of 51 ohms each, so arranged that the heating effect in each circuit is .51, or about one-half of what it was at first. Hence the amount of heat radiated from each is one-half of what it was at first. But there are 50 such circuits, therefore the total heat radiated is 25 times as much as it was with only one branch.

If the resistance of the battery and connecting-wires is considerable, then we see that the addition of every additional branch circuit takes away greatly from the amount of heat radiated from each branch, so that this plan of sub-division by separate circuits can only be adopted with success when the internal resistance is small as compared with the external resistance. We see, then, that with small internal resistance there is great gain in heating, and, therefore, in light-giving power, by arranging branch parallel circuits in multiple arc; but when the resistance of the battery and leading wires is considerable, the advantage of this arrangement is small, and very little sub-division is admissible.

INCANDESCENT LAMPS.

Now, let us consider the case of currents produced by means of dynamo electric machines, in which the electro-motive force is not constant in the same machine for the same speed, but depends upon the resistance of the circuit. An electro-motive force of 100 volts produces a current of one weber through a resistance of 100 ohms, and Mr. Swan tells us that this current, through a lamp of that resistance, gives a 60-power candle light. Now, if we reduce the length of the carbon filament in the lamp without altering the current, we reduce the illuminating power in the same ratio. Suppose we take it as four-fifths of the length, i.e., its resistance is then 80 ohms, and we shall get a 48-candle power light from the same current (one weber), i.e., with an electro-motive force of 80 volts.

With two such lamps in series we shall get two 48-candle power lights, with an electro-motive force of 160 volts, sending a current of one weber through them. i.e., the two lamps should give out a light of six gas burners of 16-candle power each, and should be sufficient to illuminate a drawing-room in many of our London houses.

If we consider now how we are to produce this current, we find that a Bûrgin machine, by the expenditure of 6 h.p., will send a current of 24 webers through an external resistance of about 7 ohms, giving an electro-motive force of 160 volts. If then we take two lamps in series, i.e., 160 ohms, and arrange 24 distinct series, we shall get a combined resistance of 160/24, or about 7 ohms, allowing for the resistance of connecting wires, and there will be a current of 1 weber through each circuit, i.e., this machine should give us 48 lights each of 48-candle power. With a resistance of 50 ohms in each lamp, the number of lamps which may be supplied from the same machine will be double this number. If we reduce our electro-motive force from 100 volts to 80 volts, with the same length of carbon in the lamp, then we reduce the current from 1 weber to 8/10 of a weber. This in the same resistance will reduce the illuminating power from 60 candles to a light of about 40 candle power, instead of a light of 48-candle power. Hence, with a given electro-motive force, more light is obtained, and, therefore, greater economy is effected by shortening the length of the carbon in the lamp, rather than by diminishing the current through the same length of carbon. Hence, the best results will be obtained in incandescent lamps by sending through them as strong a current as they will safely stand, and making the length of carbon such that the dynamo-machine employed will send such a current through them.

Take another case: Suppose we have one lamp of 75 ohms resistance (i.e., about 45-candle power). A Gramme machine or a Siemens' medium sized machine will give an electro-motive force of 100 volts, and a current of about 25 webers, at the rate of 100 revolutions a minute, through an external resistance of about 3 ohms. Hence, if we have 25 lamps in

separate branch circuits, or in multiple arc, we get 1 weber through each from such a machine, and get a light, according to Mr. Swan, of 45-candle power from each. Hence, such a machine will give us about 1125-candle power illumination. The energy expended would be about 5 or 6 h.p., so that the illumination would be about 200 candles per h.p.

We have seen above that, with the Siemens' alternate current machine, a 400-candle light requires about half a horse power; so that 1 h.p. will supply two lights of 400-candle power, from an alternate current machine at the rate of 10d. for 3 hours. The same illumination can be obtained from gas at 2s. for 3 hours. Now, two-thirds of this cost is for the supply of carbon, which becomes burnt in the arc. Hence, without this consumption of carbon, the expense per h.p. is only 10/9 of 1d. per hour. Applying this to the case of incandescent lamps, in which our carbons do not wear out, we see that by a proper arrangement of the lamps we may get a 200 candle power light at the rate of 10/9ths of 1d. per hour.

Now, Mr. Alex. Siemens also states, in his paper, that at the rate of 3s. 6d. per 1000 feet, the same illumination cannot be obtained from gas at less than 2d. per hour. Hence, allowing 8/9 of 1d. an hour for the breakage of incandescent lamps, the cost of light by gas and by incandescent electric lamps would be nearly the same.

If we allow that only a light of 40-candle power, instead of 60-candle power, can be produced at this rate, still the incandescent light cannot be regarded as an expensive light.

Now, in the absence of any actual determination, let us assume the same law to hold in the Brush system as in the Siemens or the Gramme system. In the Brush system a current of 10 webers is sent through an internal resistance of 10 ohms, and an external resistance of 70 ohms. Now, in the Siemens machine, when the external resistance is seven times the internal resistance, the current is only 1/60th part of its value when the external and internal resistances are equal, or 1/40 of its value when the external is double the internal resistance. The drawback to this arrangement would be that one-third of the total work expended would be lost in heating the machine.

Taking the Brush machine as worked at present, the difference of potential for each of 16 lamps in circuit is about 40 volts. Hence total difference of potential of 16 lamps = about 640 volts. With an external resistance of 70 ohms there is a current of 10 webers. Hence, if we arrange incandescent lamps in 10 series, so as to get a resistance of 70 ohms, we shall get one weber through each series. Put, then, 7 lamps, each of 100 ohms resistance, in each series, and we shall get 70 lamps from a Brush machine. These 70 lamps are each of 60-candle power, and all are worked by an expenditure of 16 h.p. Hence the candle power is 4200 candles from 16 h.p., or 262.5 candle power per h.p. If the lamps of this resistance are only heated, so as to give a light of 30-candle power each, then the candle power per h.p. will have to be reduced.

Thus we have seen that it is possible to sub-divide the electric current in such a way as greatly to increase the amount of illumination which may be obtained by means of a dynamo-electric machine, especially when the light is accomplished by the incandescent system of Swan, Lane-Fox, or Edison.

The earliest attempt to obtain light by incandescence in a vacuum was made by King, in 1843, who applied continuous metallic and carbon conductors, and heated them by an electric current in a Torricellian vacuum. He was followed in 1848 by Staitte, who used an iridium and platinum wire, and enveloped the holder in glass or some other non-con-

ductor. In 1872, Konn employed graphite, and rendered it incandescent in an atmosphere of nitrogen, in which there was no wasting away of the carbon. The same principles have been followed, but with greater promise of success, in the more recent attempts at producing illumination by means of incandescence. The earlier attempts failed, either (1) because of the impossibility of preventing the consumption of the carbon or other material, in consequence of the minute traces of air, which it was impossible to get rid of with the means of exhaustion which were then known; or (2) because of the presence of other gasses, such as hydrogen, which exists occluded in platinum and in other substances. It is only quite lately, since our power of obtaining a vacuum has been so greatly extended, and since we have learnt so much about high vacua from the labors of Mr. Crookes, that Mr. Swan and Mr. Lane-Fox have succeeded in obtaining vacua from which all the air and occluded hydrogen are exhausted, so that their carbon filaments and platinum wire connections remain without being destroyed, even when a current of electricity strong enough to make them give out a brilliant incandescent light has been continuously passing through them for months together. Through the kindness of Mr. Swan, and of my friend and former pupil, Mr. Lane-Fox, I am able to show you this evening how well they have succeeded in producing a brilliant and yet a steady and pleasant incandescent light. This is a triumph which many have sought in vain, and which could not have been attained except by combining together the results of investigations which have been recently carried on in several branches of physics.

I cannot conclude this course of lectures without giving my especial thanks to Mr. H. Trueman Wood, who has given me very valuable assistance, by helping me to bring together a large collection of electrical apparatus, in illustration of the interesting subject which I have had the honor to bring before you.

POSTOFFICE INSTRUCTIONS.

DIRECTING MAIL MATTER.

DIRECT your mail matter to a post-office, and if to a city, add the street and number or post-office box of the person addressed. If you are not certain that the place to which you wish to send is a post-office, inquire of the postmaster. Matter not addressed to a post-office cannot be forwarded. Write or print your name and address, and the contents, if a package, upon the upper left hand corner of all mail matter. This will insure its immediate return to you for correction if improperly addressed or insufficiently paid, and if it is not called for at its destination, it can be returned to you without going to the dead letter office. If a letter it will be returned free. Register all valuable letters and packages. Registry fee, ten cents, which, with the postage, must be fully prepaid. The name and address of sender must be given on the outside of the envelope or wrapper.

RATES OF POSTAGE.

First Class.—Letters and all other written matter, whether sealed or unsealed, and all other matter sealed, sewed, tied, or fastened in any manner so that it cannot be easily examined, 3 cents per half ounce or fraction thereof. Postal cards, 1 cent each. Postal cards are unmailable with any writing or printing on the address side, except the direction, or with anything pasted upon or attached to them.

Second Class.—Only for publishers and news agents.

Third Class.—Printed matter, in unsealed wrappers only (all matter inclosed in notched envelopes must pay letter rates), 1 cent for each two ounces

or fraction thereof, which must be fully prepaid. This includes books, circulars, chromos, engravings, hand-bills, lithographs, magazines, music, newspapers, pamphlets, photographs, proof-sheets and manuscript accompanying the same, reproductions by the electric pens, hektograph, metallo-graph, papyrograph, and, in short, any production upon paper by any process except handwriting and the copying press. Limit of weight, four pounds, except for a single book, which may weigh more.

Fourth Class.—All mailable matter not included in the three preceding classes which is so prepared for mailing as to be easily withdrawn from the wrapper and examined. Rate, 1 cent per ounce or fraction thereof. Limit of weight, four pounds. Full prepayment compulsory.

PERMISSIBLE WRITING.

No writing is permitted on third or fourth class matter except as follows: The name and address of sender on the outside of package, preceded by the word "from." On the wrapper may also be written the names and number of articles inclosed. The sender is further allowed to mark a word or passage in a book or paper to which he desires to call special attention. He may also write a simple inscription or dedication upon the cover or blank leaves of a book or pamphlet. There may be attached to articles of merchandise, by tag or label, a mark, number, name, or letter for purpose of identification. Printed circulars may contain the written name of the sender, or of the addressee, and the date. Any other writing on third or fourth class matter will subject the package to letter rates of postage, and render the sender liable to a fine of \$10 for each offense.

RATES OF POSTAGE TO CANADA.

(The Dominion of Canada embraces all the British North American provinces except Newfoundland.)

Letters and Postal Cards.—Same rates and conditions of prepayment of postage as for domestic letters and postal cards.

Other matter, same rates and conditions of transmission as for matter for delivery within the United States, except that merchandise is rigidly excluded. Samples of merchandise are mailable, but they must not exceed eight ounces in weight, and are subject to a postage of ten cents each. They must also be strictly specimens of goods for sale.

RATES TO OTHER FOREIGN COUNTRIES.

For rates of postage, conditions of pre-payment, limit of size and weight, and manner of wrapping matter addressed to other foreign countries, ask your postmaster, who is furnished with a monthly official postal guide, containing all necessary information upon this subject.

UNMAILABLE.

Obscene books, letters, papers, pictures, and postal cards; lottery circulars and letters; liquids, gunpowder, and other explosives, live animals, (except queen bees,) poisons, and any article liable to injure the mails or the persons of those handling them.

WEIGHING PACKAGES.

If you have no scales you should have all packages weighed at the post-office. The postage must be prepaid in full; otherwise the packages will not be forwarded.

RE-FORWARDING.

Letters and packages will be forwarded from one postoffice to another upon the written request of the person addressed, without additional postage charge; but unclaimed packages cannot be returned

to the sender until stamps are furnished to pay the return postage.

It is further directed or suggested that where letters and packages are intended for delivery through the general delivery of the postoffice the sender should be careful to write on the lower left hand corner of the envelope or wrapper the words "Transient," "General Delivery," or "Poste Restanti."

METEOROLOGICAL OBSERVATIONS.

No one can doubt the value of the services rendered our citizens by the Signal Bureau at Washington under the present administration. The navigator, the merchant, the farmer, and those engaged in engineering works throughout the country, are particularly benefited by the system of weather forecasts, by reason of the controlling influence of meteorological changes on their several branches of industry. The bureaus of European countries are cast into the shade by the American service and strive to adopt its methods as far as their contracted areas of observation will admit. Notwithstanding the marked advance made during the past year, there are some improvements that it would be well for the government to carry out.

In the first place, why does it not utilize the enormous number of its paid agents scattered throughout the country, for the purpose of collecting data? Every little town has its postmaster, who, if supplied with a few instruments, would be able to keep and transfer to the central office a tri-daily record of the wind direction, weather temperature, and barometer. Again, the coasts are studded with life-saving stations from Maine to the Rio Grande and from Puget Sound to the Gulf of California. If those stations were supplied with meteorological outfits they would contribute data of incalculable value. In fact, wherever there is a government official the atmospheric changes should be recorded. If a man is sufficiently intelligent to be a postmaster or an officer in the Life-Saving Service, or, indeed, to hold almost any government position, he will certainly be able to make the observations necessary with but little instruction.

The result of such a system would soon be apparent when the tornado system arrived. Those terrible phenomena are of local development, and very often organize and expend their force without materially affecting the districts covered by the present system of stations, so that the closer the points of observation are the more readily will the presence of danger be ascertained and guarded against. Another improvement would be the forecasting of weather changes for States instead of districts. For instance, a storm may be predicted to pass over the Middle Atlantic States. It will do so in the majority of cases, but is very seldom large enough to cover the whole district. The southern margin of the storm may not pass south of Albany, and consequently its influence would not be felt on the New York, New Jersey and southern New England coasts. If each State were mentioned separately the forecasts would prove more valuable.

Every effort should be made to reduce the dangers attending atmospheric changes to their lowest limit, and the government should at once order that its agents be supplied with the necessary instruments, and that a tri-daily report be sent from every town, village, and hamlet in the country to the central office.—*N. Y. Herald.*

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati Ohio, for the best illustrated instruction book.

Journal of the Telegraph.

PUBLISHED SEMI-MONTHLY AT 195 BROADWAY.

THE JOURNAL is issued on the 1st and 16th of each month. Its circulation is over 12,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,730 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....\$ 2.00
One Copy, six months, postage included..... 1.00
Single Copies, 10 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$ 2.00
Half Inch " " "..... 1.00
Quarter Column, " " "..... 4.00
Half " " "..... 8.00
One " " "..... 16.00

Rate charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, JANUARY 16, 1882.

UNDERGROUND TELEGRAPH WIRES.

THIS subject is one that may be called new to the great mass of people in the United States, but it is an old subject to practical telegraphers. The first telegraph line built in the United States, which was from Baltimore to Washington, was under ground. It did not work until it was placed on poles above ground, as at present. Telegraph builders have ever since been trying to ascertain some means or invention by which it can be made practical, and work as well under ground as it does above ground, without the disadvantages which are common to the present system. Electrical difficulties in this have been eagerly sought to be overcome, and ever since the practical working of the electrical telegraph we constantly hear of some new invention or contrivance that has been discovered in Europe or America that will allow underground wires in a cable, or tube, or coating, or inclosure of some kind, to work as easily and as well underground as if placed above ground on poles. We may emphatically say that up to the present time they have all fell far short of what has been claimed and expected of them, and that in many instances and circumstances they are an absolute failure, when the most useful and practical instruments for transmission are to be used, and also in long lines. Germany has been laying underground "compound submarine cables" rather recklessly without knowing their durability, and it is thought by practical electricians that when one wire of the compound series fails, which it may do in a few years, that their experiment will be a costly one. It is already proved that there is much loss of speed, and difficulties of sensitiveness and induction and loss of powers of transmission, although the lines are comparatively short. It is eminently a war telegraph system—safety in war—slow in peace. These are the electrical difficul-

ties which are unknown and unheard of by the popular ear. They effectually consist of the non-user or abolition of the automatic instruments by which many hundred words are transmitted and recorded in a minute, and also the abolition of the duplex and quadruplex instruments (by means of the latter four messages are sent over one wire at one time, thus answering the purpose of four distinct wires), and the duplex answering for two distinct wires, and last of all, which has suddenly come upon us, the telephone, with its still more sensitive apparatus.

After all these electrical difficulties are overcome or dispensed with, the practical difficulties still remain, the main one being that of cost, while convenience must also be considered. In this practical age convenience is regarded more than cost in many instances. In this instance the cost of placing all telegraph lines under ground in cities and towns with anything like the present convenience and facilities will be such as to make it too expensive for popular use, which in the end would be a practical prohibition of its use.

Without detailing the manner of its construction in London, which is on the elevated railroads and taken down at stations, and Paris, which is in its sewers, we can say that none of the advantages and modes of its construction in those cities exist in any of our American cities.

We will take New York City as an example. In Paris there are only 80 miles of underground lines. In New York City there are 9,000 miles of line in the streets and on housetops. Of these over 3,500 belong to and are used by the Metropolitan Telephone Company. The Gold and Stock Telegraph Company have many miles upon which the automatic instruments are used. The Western Union has 1,200 miles of wire of which only about 300 miles are on the main trunk lines and the remaining 900 supply the little local offices. It is the many local offices and places where instruments are set that is to be considered in this question of laying underground cables. If one man in a block desired communication by telephone, or the use of the Messenger Telegraph or Stock Indicator, the whole expense of digging a trench from the main office must be considered. This would greatly narrow their use. The expense for digging the trench for one wire only would be almost as great as for many of them. Then again there must be places near together on the lines by which any wire could be taken out for repair and replaced if necessary.

The Western Union Telegraph Company has now three lines of underground cables in New York City. They are in three iron tubes about three inches in diameter each, and lead from the main office of the Company to Pier 18, foot of Cortland street, North river. In these three tubes is a cable of thirty wires each. These are conducted under the Hudson river to Jersey City.

When first laid, about five years ago, there were only the two tubes and the two cables in them. The expense of laying them from the main office to the

river was at the rate of \$15,000 per mile. The cables each costing at the rate of \$5,250 per mile. About one year ago some of the wires in the cable failed to act and one cable was entirely taken out and replaced by a new one. Another tube and cable was also then placed in the trench. The expense of often replacing must also be considered, for if some of them fail it may be necessary to entirely renew the cable. The sum of \$7,500 per mile for laying underground cables is great when compared with the cost of a line of poles in the city, which rarely exceeds \$150 per mile capable of carrying many wires. In places where smaller and shorter poles can be used the expense is very much less, even as low as \$75 per mile in cities, and much less in the country. Increase of expense implies a necessary increase of rates. The interest on the cost of a mile of underground line will be sufficient to build at least four new lines the same length every year, which will last from twelve to fifteen years each. The wire costing only \$15 per mile.

The popular objection urged against the present system is that the poles and wires are "unsightly." When this is closely examined it shows it to be mere clap-trap and without any reasonable foundation, and it will more strongly apply to every means of economical and convenient carrying of merchandise and passengers in cities, without any of the chief annoyances which appertain to the latter.

Surely, the means of the conveyance of intelligence is as important and as great convenience in a community as the conveyance of persons and of merchandise. Indeed this mode of carrying news saves much personal travel by messenger or otherwise. The day has not yet arrived when underground telegraph lines in American cities will prove a convenience and be a popular success, as some will try to make others as well as themselves believe. The facts of science are stubborn things and cannot be removed or dispensed with by popular opinion or legislation.

The Index to Vol. XIV. has not yet been printed.

The cheapest place to buy pins and brackets appears to be from L. B. Harris, Manchester, N. H. See advertisement and rates in another column.

We have received the illustrated catalogue and price list of Partrick & Carter, 114 South Second Street, Philadelphia. It is to be remembered that they received the highest and only award and diploma granted at the Centennial Exhibition for Morse telegraph instruments, over all competitors. The pamphlet is useful and instructive, containing, as it does, illustrations of telegraph and electrical goods of every description. It also contains a catalogue of standard books on electricity and electrical telegraph.

It is recommended by M. Duboseq that the carbons in the electric arc lamps should not be placed exactly in the same line. When they are so arranged he says that the positive carbon is formed into a depression, at the bottom of which and masked by its edges, is found the most intense light.

THE CENTRAL AND SOUTH AMERICAN CABLES.

The India-Rubber and Gutta-Percha Telegraph Works Company's s.s. *Dacia* left Greenhithe on the morning of Saturday the 19th ult., having on board over 800 miles of cable for the Central and South American Telegraph Company. Stress of weather, however, compelled her to put into Plymouth and she left England finally on the Wednesday after, at daylight. It will be remembered that the s.s. *International* left on the 9th November with a portion of the cable for the above-named company. The loading of the *Dacia* was very remarkable for speed at which the cable was coiled on board. It seems that the vessel was handed over by the post-office authorities (who had chartered her for the recent repairs to their cables) on Monday the 7th of November. She was then docked, cleaned, painted, and moored off Silvertown on Thursday morning the 10th, leaving that place on the Tuesday evening following, having shipped the cable at the rate of 165 miles per day. This includes some slight waste of time, owing to a strike amongst the cable coilers. The following are the stations and lengths of cable of this company:—From Vera Cruz to Goatsacalcos, 90 miles; Goatsacalcos is connected with Tehuantepec or Salina Cruz by a land line about 220 miles in length; the cable then continues from Salina Cruz to San José de Guatemala, 320 miles; from San José to Salinas Bay, distance 390 miles; from Salinas Bay to Punta Mala at the mouth of Panama Bay, 560 miles; from Punta Mala to Panama Town, 95 miles; from Punta Mala again to Buenaventura, 320 miles; Buenaventura to St. Elena, 500 miles; from St. Elena a branch land line of 110 miles is run to Guayaquil; St. Elena is then connected by cable to Payta (Peru), 230 miles; the last section of this company's cable being from Payta to Chorillos, 580 miles. At Chorillos (the landing place for Lima) the line joins that already existing and belonging to the West Coast of America Telegraph Company.

The s.s. *Retriever*, the repairing vessel of this latter company, has been chartered to accompany the present expedition, and to thoroughly survey the route over which it is proposed to lay the cables. The India Rubber and Gutta-Percha Company have sent out an experienced chemist to analyze the nature of the specimens taken from the bottom during sounding operations. We believe this is the first occasion on which such kind of investigations has been undertaken by a cable company, and the management at Silvertown is deserving of all credit for its meritorious endeavors to increase our knowledge of that part of the globe, of which so little is known, viz.—the ocean bed. These operations will be carried out under the direction of Mr. E. W. Parsons, the engineer and manager of the West Coast Company. The *Retriever* is very completely equipped for the purpose of these researches, having on board, besides the usual cable repairing gear, a steam sounding machine (a modification of Sir W. Thomson's wire sounding apparatus). A chemical laboratory is also fitted up on board. The intention is to take some 900 or 1,000 soundings at an average distance apart of four miles; this, of course, does not include a large number which will be taken at closer intervals near the landing places. Up to the present all that has been considered necessary in this direction was to take soundings at intervals of about 30 or 40 miles, and in fact, when the Atlantic cables previous to 1875 were laid, the soundings numbered only 57, over a distance of 1,700 miles. It may here be added that the India-Rubber and Gutta-Percha Company were the first to use

Thomson's wire-sounding machine extensively, the first experiment dating from November, 1872; and in 1875, on the same coast, whilst submerging the West Coast of America Company's cables, 460 soundings were taken over a distance of nearly 1,700 miles, exclusive of soundings for landing places.

It will be seen from the foregoing statements with what very great care the operations of this company are carried out in every detail, and we venture to say that the benefits to be derived from such a series of investigations as those mentioned above must be immense, not only to the company conducting them, but also to all who are connected directly or indirectly with shipping and commercial interests in that quarter of the world.

Out of the 3,000 and odd miles of cable ordered by the Central and South American Company, 1,750 miles are already manufactured, and the greatest turn out in one week on this order, not including any of the usual outside work, was 174 miles.—*Telegraphic Journal*.

THE TELEGRAPH IN WALL STREET.

TELLING OF RICHES OR RUIN AMID ITS CLICKING.

THERE is an India ink sketch, by a New York artist, which illustrates the allegorical and practical sides of Wall street speculation. The practical side is exemplified in four vignettes, and on the passe partout surrounding and enclosing them is portrayed the allegorical side. In the first vignette a countrified old gentleman is looking at the tape as it rolls from the "ticker," or stock indicator. He is a bull; stocks are rising, and he manifests every indication of delight. On the passe partout is a hill, on the summit of which stands a bull with head tossed defiantly. At the foot sits a bear in a dejected attitude. In the second vignette the scene is the same, but the smile has left the old gentleman's face, and he is regarding the tape with some alarm. The market is beginning to weaken. On the border the bear is climbing the hill, and the bull is waiting with lowered head. In the third vignette the old gentleman is in a distracted condition, and he is looking on the tape in dismay. The market is falling slowly. In the border the bull and the bear are in fierce conflict on the top of the hill, and the bear has a trifle the advantage. In the last vignette the irascible old gentleman has smashed the ticker with his umbrella, and is rushing off with disarranged clothing and the tape tangled in his legs. The market has had a heavy tumble. On the border the bull is tumbling head foremost down the hill, and the bear is sitting on the summit triumphant. The scenes illustrate one of the chapters of the story of the "ticker." Less exaggerated scenes of joy, doubt, and despair are enacted around the unfeeling little instruments every day. The tape conveys messages of fortunes won or fortunes lost, of riches or of ruin. Wherever a "ticker" is placed in a public resort, men gather continually around it until it ceases to give quotations. But they are chance comers, who have dropped in to see how a certain stock or the market in general is going, and they are seldom large operators. The genuine speculators are to be seen hovering over the tape in the offices of the brokers near the Stock Exchange. They impatiently watch every quotation, and when operating "catch the market"—that is, buy or sell at the price then ruling before it has a chance to change. Messengers are in waiting to convey their orders to the brokers on the floor of the Exchange. The employees of the Exchange find the broker and give him the order. The broker does exactly as he is ordered. If buying at "market," he does the best he can. As he makes a purchase or a sale the

reporters of the Gold or Stock Telegraph Company note it, and then the work of the "ticker" begins.

Eight reporters are on the floor of the Exchange, and the head reporter is Mr. C. M. Beecher. They wear blue caps with gold bands, and the letters "G. & S." All are skilful telegraph operators, and are selected for their intelligence and alertness. The different stocks on the list are proportioned among them, and each one has a certain line to look out for. Wherever one sees business done he takes down the quotations. He has a pad of paper about five inches in length by three in width, ruled in perpendicular lines. At the head of each line is the abbreviation of a stock title, as "K. T." for Missouri, Kansas and Texas. As he catches the quotations he jots them down in the lines under the proper titles. Having got the latest quotations on such of his stocks as are active, he hastens to the nearest telegraphic instrument. There are thirteen instruments in different parts of the room. The reporter rattles off his quotations as fast as possible and renews his search for information. The brokers afford them every facility for gathering news, and often give them notes of quotations. In this way the report is made very complete, and few quotations are missed. At the close of business each reporter makes up a list of the closing prices and hands it to Mr. Beecher, who telegraphs the figures to the offices of the Gold and Stock Telegraph Company.

In the receiving room in the fourth story of the Western Union building are six clerks with instruments before them. The central figure is the operator who receives all the dispatches from the reporters of the Stock Exchange. He writes them quickly and plainly on a slip of paper and sticks it in a frame in front of him. The frame is so placed that the two operators can see the figures plainly. The operator on the right runs the stock "tickers," and the one on the left the general news "tickers." The first-named operator has a set of black and white keys, precisely like a piano, set before him. The keys are marked with letters and numbers. That keyboard operates all the stock "tickers" in this city and "tickers" as far away as Newark and Orange. The operator reproduces every quotation. The general news operator takes only the more important quotations. He also reproduces what appears on a tape of Kiernan's financial "ticker" that reels off before him. He works on a keyboard of different pattern, in which the keys are set in two concentric circles. These are the two great and important divisions of the "ticker." It is estimated that when business in the Exchange is running at an ordinary rate, a quotation can be caught by the reporter, telegraphed to the central office, be sent out again and reappear on all tapes inside of half a minute. When business is livelier the operators fall somewhat behind the quotations, but five minutes is the extreme time of delay. A broker makes a sale, and before he can get back to his office, a few blocks away, it is there on the "ticker" ahead of him. The two other operators in the receiving room receive reports from the Mining Exchange and send them out on the mining "ticker." There is another instrument in the room which records in telegraphic dots and dashes every dispatch received from the Stock and Mining Exchanges. It is intended to act as a check on the reporters and the receiver if a dispute should arise concerning a despatch. Opposite the operators is a complete duplicate set of instruments which they could at once use in case of accident to the other set. On the wall hangs the large gravity clock which regulates the time "tickers." It is a wonderful piece of accurate mechanism, and was made by Prof. James Ham-

blet, the manager of the time service. It is regulated each day by despatches from the observatories at Pittsburgh, Washington, and Cambridge.

The "tickers" in use in this city at the time of the report in November were: Stock, 867; general news, 126; cotton, 86; produce, 68; time, 82; mining, 39; and Kiernan's Financial. The Gold and Stock Telegraph Company controls individually all these tickers, except the last named, which it manages for Senator John J. Kiernan. The Kiernan financial "tickers" report only a few of the stock operations, but give general financial news and any other news of interest from all over the world. He controls the portion of the city below Chambers street. The same news is furnished above Chambers street by the general news "ticker" of the Gold and Stock Company.

Besides having reporters in the Stock Exchange, the company has similar reporters in the Mining, Produce and Cotton Exchanges. Their reports are received by operators in the large hall of the Western Union Telegraph Company and are sent out from there. The time "tickers" are furnished to jewellers, railroads, and other offices where the exact time is desired. It is an adjunct to the time ball, which falls precisely at noon on the pole on the summit of the Western Union Building. The little instrument in a jeweler's shop beats every two seconds, and at the beginning of each hour and quarter hour strikes like an ordinary clock.

"Tickers" are of two kinds of manufacture. Some print a continuous line on a narrow tape, and others print two lines on a wider tape, one being the title of the stock, and the other its price. The single-line instrument is run by weights, and the two-line, or three-wire instrument, is run by electrical power from the central office. The 1,563 or more "tickers" are on different circuits, averaging from twenty to forty "tickers" to a circuit. Each circuit is visited daily to see that it is in running order. The inspectors visit each "ticker" twice a week to clean it, ink the pads, supply tape, and ascertain if it is in good working order.

The work of the "ticker" is not confined to this city. Mr. George W. Scott, the Superintendent, furnished a report of the "tickers" in operation by the company in other large cities. These "tickers" are, however, not worked direct from New York offices. The quotations are sent to a central operator in other cities, and he sends them to the "tickers." Among the cities having the greatest number of "tickers" are: Boston, 111; Chicago, 142; Baltimore, 91; Cincinnati, 70; St. Louis, 69; Buffalo, 43, and Cleveland, 32. A sale in the Stock Exchange is known in Chicago within less than two minutes. The reporters and operators are so skilful that a mistake is rare. The brokers are quick to notice an error, and a correction is at once made.

Ladd, who has an office next to the Stock Exchange, is the official time keeper. At 2½ P. M. each day—the regular time for closing of deliveries of stock—a wire from Ladd's office is switched on to the "tickers," and the familiar fifteen beats are sounded. After that time no deliveries of stock can be made.—*N. Y. Sun.*

SIGNAL SERVICE AT SEA.

A LARGE supply of meteorological reports, weather maps, blanks for recording observations, charts and signal codes has been received at the United States Marine Agency in this city for gratuitous distribution to shipmasters. The captain of any vessel about to sail from this port is invited to call at No. 66 Beaver street, where Marine Agent H. J. Penrod is prepared to give them all the instruction required

in regard to the use of the documents. The captains are expected to make observations during their voyages, and at the earliest opportunity forward their reports to General W. B. Hazen, Chief Signal Officer, at Washington.

Correspondence.

COUNTING SIGNATURES AND TITLES.

To the Editor of the Journal of the Telegraph.

In your issue of January 1st, 1882, under the head of "Titles of Signatures," you quote Executive Order No. 174: "The title of the sender of a message, when such title does not exceed two words, will not be included in the check, but will be transmitted free of charge as part of the sender's message."

As an answer to "Inquirer," who asks for decision in counting three signatures,

"J. W. Jones,

Pres. Cotton Exchange,

Paul Kennedy,

M. O. Crawford,"

and you decide six extra words, in which I beg to disagree with you, and call your attention to a paragraph of Rule nine, book of Rules, page 10, which reads, "Whenever more than one signature is attached to a message, count all except the last, as a part of the body of the message."

The rule you quote would be applicable only where there is one signature with a title, but in the above I would count all but the last, according to rule 9, as a part of the body of the message. Or if J. W. Jones, President of Cotton Exchange, was the last signature, order 174 could be applied to the title, with one extra word.

As I understand those rules, it is immaterial to us who the sender is, our duty being to transmit the message as written and counting according to rule.

B.

Ans.—Our correspondent is correct. We overlooked Rule 9, book of Rules, page 10, which should apply to the counting of signatures.

DONATIONS FOR RELIEF OF THE FAMILY OF THE LATE D. T. FRANCOIS.

To the Editor of the Journal of the Telegraph:

SIR: Mr. Daniel T. Francois, an old well known and experienced operator, died of small-pox in Chicago, Sunday, January 1st., after an illness of only three days. He left a wife and two small children in destitute circumstances. Friends here have started a popular subscription for their benefit and with most encouraging success. Those who desire to help the widow and the fatherless, and to testify a kind remembrance of poor Dan, may do so by remitting to Mr. Samuel O. Bracken, chief operator, (treasurer of the relief fund) Western Union Telegraph, Chicago.

A. L. B.

CHICAGO, January 10, 1882.

PRESENTATION.

NEW YORK, Dec. 27, 1881.

To the Editor of the Journal of the Telegraph:

As the business of the John street Central office, 198 Broadway, Metropolitan Telephone and Telegraph Co., New York city, was nearing to a close on the 24th inst., E. F. Galick, on behalf of the remaining employees of the office, presented the Manager, Mr. T. G. Ellsworth, with one of Mackinnon's solid gold patent pens, enclosed in a beautiful case with

the following address: "We take pleasure in presenting to you as a token of our respect and esteem this pen. We hope that it will enable you to impart to others some of your own character, generosity, and kindness, such as you have shown us in the past. We regret our expected parting soon, and we all join in wishing you a Merry Christmas and a Happy New Year." The pen is chased in the most artistic manner, with the inscription, "T. G. E., Christmas, 1881." The occasion was one that will long be remembered. M.

DEATH OF MR. B. H. JOHNSON.

At the meeting of the Telegraphic Fraternity of Cincinnati and vicinity this afternoon to take action on the death of B. H. Johnson, late chief operator Western Union Telegraph, Cincinnati office. Organized by choosing Mr. E. O. Armstrong, of Bell Telephone Company, chairman; George A. Clark, secretary.

Following committee appointed to draft resolutions expressive of the sentiment of the fraternity: I. N. Miller, A. T. Gould, William Fellows, J. M. Spencer, J. O. Hall and W. J. Lawler.

During the absence of the committee, remarks eulogistic of the life and character of the departed chief, were made by Messrs. Dunlap, at present assistant chief operator, and Mr. Capen, late assistant chief operator, under Mr. Johnson; Mr. Edward Hadley, Mr. H. M. Bulison, Jr., E. O. Armstrong, J. E. Bruce and others. The committee on resolutions reported the following:

Whereas, We have learned, with feelings of deep sorrow and regret, of the death of Mr. Barton H. Johnson, our late respected and beloved chief operator; we his friends and co-workers have met to testify to his many good qualities, his kindness of heart, his moral worth both as a true Christian gentleman and efficient officer;

Resolved, That we deeply mourn the dispensation of Providence that has deprived us of a noble, upright friend and the home circle of a gentle kindred spirit, we nevertheless bow in humble submission to the will of Him who doeth all things well;

Resolved, That we extend to the bereaved family our warmest sympathies in this hour of its affliction.

A. T. GOULD,
Chairman.

The fraternity will attend the funeral in a body and escort the remains from the residence of the deceased on Oak street, Walnut Hills, to the church in Lane Seminary Grounds, 2 P. M. Sunday, January 15th.

PRESSURE OF WIND IN STORMS.

MR. O. SHALER SMITH has applied the results of the observations of several years to the estimation of the amount of pressure that has been exercised by the wind in gusts of extraordinary violence. The most violent storm of which he has a record occurred at East St. Louis, Ill., in 1871, when a locomotive was blown over by a wind pressure of 93 pounds per square foot. The jail at St. Charles Mo., was destroyed in 1877 by a pressure of 84., pounds per square foot; a brick dwelling at Marshfield, Mo., in 1880, by a force of 58 pounds per square foot. Railway trains may be blown from the track, and bridges prostrated by pressures of from 24 to 31 pounds per square foot. These estimates are based upon the calculation of the smallest amount of pressure that would do the damage.

An order posted at Hornellsville, N. Y., forbids any engineer or fireman from running by the telegraph office with the steam cock open, because operators are thereby disturbed.

Tariff Bureau.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, January 16, 1882.

To all offices on Western Union lines:

The following changes which have been made since January 1, 1882, should be entered in the Tariff Book as they will not be republished.

ALABAMA.

267 Hurtville should read 267 Hurtsboro.

COLORADO.

634 Arboles. P. O. care Supt. Tel. D. & R. G. Ry., Denver.
* Eureka, closed.
599 Cranes Park, closed.

CONNECTICUT.

37 Watertown, reopened as * Watertown, 10 0 by telephone, Waterbury.

DAKOTA.

914 Westport, closed.

FLORIDA.

* * Maitland, now * Maitland, 150 9 Lake City.
* * Orlando, now * Orlando, 150 9 Lake City.

GEORGIA.

246 Hapeville, closed.

IDAHO.

578 Oneida changed to 578 Arimo.

ILLINOIS.

* * Morgan Park, Cook Co., now * Morgan Park, Cook Co. 10 0 by telephone, Washington Heights.

IOWA.

417 Camden changed to 417 Pol5.
425 Trafton changed to 425 Hardy.

KENTUCKY.

The telephone line Frankfort to Alton, Farmdale, Lawrenceburg and Tyrone has been abandoned. Until further notice, messages for the places named will be mailed from Frankfort.

LOUISIANA.

* Campte, closed.
424 Atchafalaya River, closed.

MARYLAND.

85 Mount Hope (Retreat, P. O. care Baltimore. Erase "P. O. Cantonville."
67 Worton, closed.

MEXICO.

The following are changes in tariff for "other" lines from Brownsville, Texas:

| | |
|-----------------------------|---------------------------|
| Acaponeta, 450 43. | La Ventura, 400 40. |
| Allende del Parral, 450 43. | Laredo, 224 21. |
| Altata, 450 43. | Linares, 164 15. |
| Avino, 450 43. | Marin, 149 14. |
| Bagdad, 50 4. | Mier, 77 7. |
| Cadercyta Jim, 115 11. | Monte Morelos, 149 13. |
| Carmago, 67 6. | Monterey, 124 11. |
| Cerralvo, 95 9. | Reynosa, 50 4. |
| Cerro Gordo, 450 43. | Rio Florido, 450 43. |
| Chalchihuites, 450 43. | Rosales, 450 43. |
| Concordia, 450 43. | Rosario, 450 43. |
| Copala, 450 43. | Salinas Victoria, 149 14. |
| Cosala, 450 43. | Saltillo, 150 14. |
| Quencame, 450 43. | Salto, 450 43. |
| Elota, 450 43. | San Ignacio, 450 43. |
| Guadalupe, 500 48. | San Luis Potosi, 465 46. |
| Guerrera, 102 9. | Santa Rosalia, 450 43. |
| Jalapa de Vera Cruz 425 40. | Villadama, 164 15. |
| Lampazos, 184 17. | Villagran, 180 17. |

MICHIGAN.

119 Butters Junc., changed to 119 Manistee Junc.

MISSOURI.

369 Richfield, closed.
360 St. Paul, P. O. Sherman.

NEBRASKA.

Messages to the following named "other" line offices in Nebraska can no longer be sent via the routes (Lincoln, Hastings, York and Kearney) given in the new Tariff Book. All messages must be sent and checked via Plattsmouth, at the "other" line rates named below.

| | | |
|--------------------|--------------------|------------------------|
| Alma, 45 3. | Endicott, 35 2. | Marquette, 55*4. |
| Arapahoe, 50 3. | Exeter, 35 2. | Newark, 40 3. |
| Ashland, 30 2. | Fairmont, 35 2. | Odell, 35 2. |
| Aurora, 25 2. | Friendville, 30 2. | Orleans, 45 3. |
| Ayr, 40 3. | Grafton, 35 2. | Oxford, 50 3. |
| Bloomington, 45 3. | Greenwood, 30 2. | Pawnee City, 25 2. |
| Blue Hill, 40 3. | Guide Rock, 40 3. | Red Cloud, 40 3. |
| Bradshaw, 25 2. | Hampton, 25 2. | Republican City, 45 3. |
| Calvert, 25 2. | Hardy, 40 3. | Reynolds, 40 3. |
| Cambridge, 50 3. | Harbine, 40 3. | Riverton, 45 3. |
| Cedar Creek, 30 2. | Harvard, 35 2. | South Bend, 30 2. |
| Chester, 40 3. | Hubbell, 40 3. | Superior, 40 3. |
| Cowles, 40 3. | Indianola, 50 3. | Sutton, 35 2. |
| Crete, 30 2. | Inland, 35 2. | Waverly, 30 2. |
| Culbertson, 55-4. | Junata, 40 3. | Wilber, 30 2. |
| De Witt, 30 2. | Kenesaw, 40 3. | Wymore, 35 2. |
| Diller, 35 2. | Louisville, 30 2. | |
| Dorchester, 30 2. | Lowell, 40 3. | |

NEW BRUNSWICK.

3 Albert Mines, closed.
3 Curryville, closed.
3 Edmouton, closed.
3 Hopewell changed to 3*Albert.
* * Indiantown, now W. U. office. Tariff same as St. John.
3 Rockland, closed.
3 Tracy, closed.

NEW JERSEY.

47 Kingston, closed.
* * Somers Point, now * Somers Point, 10 1 Pleasantville.

NEW YORK.

40 Browns Station. Erase "Ok. Shokan."
44 Burlighs, closed.
40 Chichester should read 40 Chichester.
63 Ellenburg should read 63 Ellenburg Depot.
44 Irondale, closed.
56 Knappe should read 56 Knappe Station, St. Lawrence Co., P. O. No. Stockholm.
Erase " * * Sandy Creek Junction."
44 Paul Smith's is in Franklin Co. Erase "P. O. care Bloomingdale."
44 Willsboro, closed.
33 Winfield, L. I., is in Queens Co.

NOVA SCOTIA.

2 Arcadia Iron Mines, closed.
1 Bird Rock Island, closed.
2 Gt. Village. Erase "P. O. care Arcadia Iron Mines."
2 Londonderry Station. Erase "P. O. care Arcadia Iron Mines."
1 Magdalen, closed.
1 Meat Cove, Cape North, now * Meat Cove, Cape North.
25 1 North Sydney.
2 Rockland Station, closed.

OHIO.

159 Palestine is in Columbiana Co. not Columbia Co.
222 Reesville, closed.

ONTARIO.

Bulwer, closed.

PENNSYLVANIA.

59 Abattoir Drove Yards. Erase "Ok. Philadelphia."
130 Bronson's, closed.
* Centreville, York Co., now 25 2 McCalls Ferry. Erase "25 2 Philadelphia."
93 Columbia Cross Roads, closed.
* * Evansburg Village now * Evansburg Village, 25 2 from Linesville.
140 Franklin is in Venango Co.
151 Glenwood, reopened.
46 Pond Creek, closed.
* * Scottsdale is now, W. U. office, square 131.

RHODE ISLAND.

18 Drownville, closed.

TENNESSEE.

Offices in Tennessee will correct their list of State rates by changing the rate to Virginia from 75 5 to 60 4.

TEXAS.

492 Borden, closed.
483 Emory should read 483 Emory.
654 Greeton should read 654 Grelton.
654 Jaton, closed.
* Liberty Hall should read * Liberty Hill.

VIRGINIA.

Offices in Virginia will correct their list of State rates by changing the rate to Tennessee from 75 5 to 60 4.

* Eagle Rock, closed.
113 New Market is in Shenandoah Co.
* Norwood, closed.

WISCONSIN.

306 Ozaukee, closed.
306 Port Washington. P. O. Ozaukee. Erase "Ok. Ozaukee."
855 Richardson changed to 855 Turtle Lake.

ATLANTIC CABLE.

The cable between Amoy and Shanghai repaired. The Fal-mouth rate should still be collected on account of the interruption north of Japan.

The following new stations have been opened in China. Rate, per word, from London, \$2.25. Soochow, Chinkiang, Tientsin, Chinkiangpoo, Chining, Linkching and Taku. Messages for Peking mailed daily from Tientsin.

CUBA CABLE.

The cable between Jamaica and Colon interrupted. During the interruption, deduct 73 cents per word from rates to Colon and Paffama.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in double columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

The following rates to new squares 659, 660, 661, 662, 663 should be entered on the new tariff sheet by offices in square, 560, 566, 622, 625, 626, 627, 629, 630, 633, 635 and 637.

| From | | To Squares. | | | | |
|--------|------|-------------|------|------|------|----|
| Square | | 659 | 660 | 661 | 662 | 66 |
| 560 | 75 5 | — | — | — | — | — |
| 562 | 75 5 | — | — | — | — | — |
| 566 | 75 5 | — | — | — | — | — |
| 622 | 75 5 | — | — | — | — | — |
| 625 | 75 5 | — | — | — | — | — |
| 626 | 80 4 | 75 5 | — | — | — | — |
| 627 | 80 4 | 75 5 | — | — | — | — |
| 629 | 80 4 | 75 5 | — | — | — | — |
| 630 | 80 4 | 75 5 | — | — | — | — |
| 633 | 75 5 | — | — | — | — | — |
| 635 | 50 3 | 60 4 | 75 5 | — | — | — |
| 637 | 40 3 | 50 3 | 60 4 | 75 5 | — | — |
| 659 | 40 3 | 40 3 | 50 3 | 60 4 | 75 5 | — |
| 660 | 40 3 | 40 3 | 40 3 | 50 3 | 60 4 | — |
| 661 | 50 3 | 40 3 | 40 3 | 40 3 | 50 3 | — |
| 662 | 60 3 | 50 3 | 40 3 | 40 3 | 40 3 | — |
| 663 | 60 4 | 60 4 | 50 3 | 40 3 | 40 3 | — |

Where no square rate is given, the State rate will apply.

ALABAMA.

285 Bangor.
294 Calera.
323 Epes.
* Ft. Morgan, 75 5 Mobile.
* Gainesville, 25 2 Epes.
* Point Clear, 60 3 Mobile.

ARIZONA.

660 Canon Diablo. P. O. 659 Winslow P. O. Brigham City.
659 Holbrook.

ARKANSAS.

449 Brentwood.
391 Jacksonport.
449 North Brook.

COLORADO.

546 Agate.
565 Boreas.
540 Buffalo, Weld Co.
623 Calumet.
552 Carr.
545 Deuel, P. O. Morgan.
541 First View.
546 Godfrey, P. O. care Deer Trail.
545 Hardin, P. O. care Evans.
590 Holleys.
599 Hortense.
623 Hot springs.
634 Ignacio.
540 Liff, P. O. care Big Spring, Neb.
557 Red Cliff.
628 Sargents.
586 South Pueblo, Ch. Pueblo.

CONNECTICUT.

* Naubuc, 30 3 Hartford.
* Noroton, 10 0 by telephone, Stamford.
* Winnipauk, 10 0 by telephone, Norwalk.

DAKOTA.

- 915 Chamberlain. 895 Mayville.
947 Dickinson. 898 Montrose.
890 Gardner. 920 Northville.
890 Hillsboro. 915 Ordway.
926 Hitchcock. 903 Preston.
• Crook City, 50 2 by telephone, Deadwood.
• Fine Ridge Agency, 150 9 Cheyenne Wy.
• Rosebud Agency, 175 10 Cheyenne Wy.
• Spear Fish, 50 2 by telephone, Deadwood.
• Sturgis City, 50 2 by telephone, Deadwood.

FLORIDA.

- Highland, 50 4 Lake City.
• Moccasin, 50 3 Lake City.
• Paola, (N. M.) 100 6 Lake City.

GEORGIA.

- 207 Dubois. 216 Lula.
245 East Point. 227 Oglethorpe.
187 Folkston, P. O. Centre Village.
• Abbeville (N. M.) 40 3 Ft. Gaines.
• Arlington, 40 3 Ft. Gaines.
• Blakely, 40 3 Ft. Gaines.
• Senola, (N. M.), 25 2 Newman.

IDAHO.

- 578 Arimo.

ILLINOIS.

- 800 Allendale. 307 Dumper.
947 A pine. 345 Forrester Juno.
328 Beecher City, Edinham, 3 6 Lanark Juno.
Co. 307 Mannheim.
329 Belknap. 347 Oakford.
337 Breckenridge. 337 Rockville.

INDIANA.

- 280 English Lake. 262 Milroy.
253 Letts corner. 290 Paxton.
298 Lowell. 253 Westport.
• Ferdinand, By mail, Ferdinand Station.
• St. Meinrad, By mail, Ferdinand Station.

IOWA.

- 426 Angus. 407 Laurel.
387 Buffalo. 397 Libertyville.
425 Dakota City. 435 Lehighville.
367 Fairport. 367 Montpelier.
416 Galt. 455 North Boro.
407 Girard. 416 Pilot Mound.
425 Hardy. 417 Polo.
416 Harcourt. 425 Rutland.
425 Irvington. 473 Raux.
454 Irwin. 407 Van Cleve.
383 La Orew. Ok. Hamill. 425 West Bend.
435 Lake City. 425 Willow Glen.

KANSAS.

- 517 Alum Creek. 514 Galva.
456 Argentine. 506 Hazelton.
466 Barclay. 503 Horton, P. O. care Emporia.
527 Cleveland. 475 Wakarusa.
517 Clinton. 466 Westphalia.
527 Collyer.
• Cottonwood Falls, 50 0 Cottonwood.
• Enterprise, 15 0, by telephone, Detroit.

KENTUCKY.

- 263 Bloomfield. 263 Finchville.
263 Crescent Hill. 263 Taylorsville.
• Clay Lick, 25 1 by telephone, Worthville.
• Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Huntington, W. Va.
• Eastern Juno., 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
• Flemingsburg, 15 2 by telephone, Johnson Juno.
• Gistville, 25 1 by telephone, Worthville.
• Gratz, 25 1 by telephone, Worthville.
• Lockport, 25 1 by telephone, Worthville.
• Marlou, 15 1 by telephone, Worthville.
• Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
• Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. Va.
• Port Riffe, 25 1 by telephone, Worthville.
• Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
• Springport, 20 1 by telephone, Worthville.

LOUISIANA.

- 424 Eola. 433 Provençal.
424 Garford. 433 Robeline, P.O. care Mansfield.
442 Grand Cane. 442 San Patrice.
354 Lookout. 442 Stonewall.
434 Mermonteau. 424 Whiteville.
383 Mounds Sta.
442 Pleasant Hill.
• Millikens Bend (N. M.), 40 3 Tallulah.
• Plaquemine, 50 3 New Orleans.
• St. James, 50 3 New Orleans.
• Vacherie, 50 3 New Orleans.

MARYLAND.

- 77 Bowie. 85 Odenton.
67 Edgewood. 54 Peninsular Juno.
85 Lutherville. 54 Pocomoke Station.
77 Marlboro.

MASSACHUSETTS.

- 36 Conway. 21 Wellesley Hills.
• Bass River Harbor, 05 0 by telephone, So. Dennis.
• Cochesett, 25 0 by telephone, East Bridgewater.
• Collins' Mills, Dracut, 15 1 by telephone, Lowell.
• Dracut Navy Yard, 15 1 by telephone, Lowell.
• Forge Village, 15 1 by telephone, Lowell.
• Graniteville, 15 1 by telephone, Lowell.
• Hyannisport, 15 0 by telephone, Hyannis.
• Lunenburg, 20 0 by telephone, Fitchburg.
• Matfield, 50 0 East Bridgewater.

- Melrose Highlands, 25 0 Melrose.
• Middlesex Village, 15 1 by telephone, Lowell.
• Phenix Village, Tewksbury, 15 1 by telephone, Lowell.
• South Bluerica, 15 1 by telephone, Lowell.
• South Mills, 10 0 by telephone, New Bedford.
• Westatham, 35 0 by telephone, Providence, R. I.
• West Bridgewater, 15 0 by telephone, East Bridgewater.
• W. Chelmsford, 15 1 by telephone, Lowell.
• Westford, 25 0, Westford Depot.
• Westford Depot, 15 1 by telephone, Lowell.

MEXICO.

- Paso del Norte, 05 0 El Paso, Tex.

MICHIGAN.

- 220 Beech. 119 Manistee Juno. P. O. care Tallman.
231 Bridge water. 210 Mariette.
210 Brockway Centre. 210 Mayville, P. O. May.
119 Free Soil. 127 Vanderbilt.
127 Indian River.
231 Jerome.

MINNESOTA.

- 190 Argyle. 870 Oshawa.
865 Arlington. 869 Rock Island Quarry.
865 Hamburg. 878 Vernon Centre.
889 Kennedy. 865 Waconia.
890 Muskoda.

MISSISSIPPI.

- 351 Courtland. 363 Morton.

- Arcola, 80 6 Vicksburg.
• Johnsonville, 80 6 Vicksburg.
• Stoneville, 80 6 Vicksburg.

MISSOURI.

- 457 Ellis. 428 Montserrat.
869 Ellah. 398 Shelbyville, Ok. Shelbyna.
• Augusta, By mail, Labadie.
• Furdin, 25 2 Unionville.

MONTANA.

- 957 Fallon. 957 Milton.
956 Keith. 883 Silver Bow Juno. P. O. care Butte City.

NEBRASKA.

- 927 Atkinson. 922 Long Pine.
• Ben'sman, (N. M.) 60 4 Plattsmouth.
• Burchard, (N. M.) 35 2 Plattsmouth.
• Liberty, (N. M.) 35 2 Plattsmouth.

NEW BRUNSWICK.

- 3 Albert. 3 Lake Ha Ha.
3 Carleton Sta. 3 St. Louis.
• Port Egin, 25 2, Sackville.

NEW HAMPSHIRE.

- 30 Livermore.
• Chesterfield, 25 0 by telephone, Brattleboro, Vt.
• Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
• North Hinsdale, 20 0 by telephone, Brattleboro, Vt.

NEW JERSEY.

- 41 Brick Church. Tariff 47 Clementon.
same as Orange. 47 Magnolia.
53 Cedar Brook. 52 Valley.
41 Centerville, Passaic Co.

NEW MEXICO.

- 637 Gallup. P. O. care Win- 632 Monero.
gate. 630 San Antonio.
• Fort Stanton, 25 2 San Marcial.

NEW YORK.

- 64 Albion Station Oswego 51 Rockland.
Co. Ok. Sand Bank. 74 Scoria.
65 Apsalachi. 44 Trembly's Iron Works.
51 Fish's Eddy, Delaware Co. P. O. care Clayburg.
64 Mannsville. 65 Vestal.
83 Nichols.
• Minisink, Orange Co., 15 1 Port Jervis.

NORTH CAROLINA.

- 205 French Broad. 178 Newton.
• Falkland, (N. M.), 25 2 Tarboro.
• Pactilus, (N. M.), 40 3 Tarboro.

NOVA SCOTIA.

- 2 Albion Mines. 2 Sherbrooke.
• Baddeck, 25 1 North Sydney.
• Ingonish, 25 1 North Sydney.

OHIO.

- 221 Alvada. 221 McClure.
180 Everett, Summit Co. 180 New Berlin, Stark Co.
202 Hadley Junction. P. O. 159 Strasburg, Stark Co. P.
Thurston, O. Maximo.
221 Luckey. 213 Wheelersburg.
• Haysville, Ashland Co., 15 1 by telephone, Ashland.
• Monroe Centre, 20 2 No. Kingsville.
• Pierpont, 25 2 No. Kingsville.

PENNSYLVANIA.

- 140 Corsica. 140 S. and A. Junction. P. O. care Mercer.
122 Elk Lick. 181 Stonerville.
151 Etna, Allegheny Co. 130 Thompsons, Warren Co.
140 Evansburg, Butler Co. P. O. care Irvine.
P. O. Breakneck. 59 Virginville, Ok. Moslem.
181 Fallston.
140 Lucinda Station. P. O. 151 Willow Grove, Allegheny Co.
Lucinda Furnace. 140 Wilmington. P. O. New
140 Neshannock Falls. 140 Wilmington.
111 Songbird. P. O. care 140 Zellenople.
Custer City.
• Academy Corners, 15 1 by telephone, Lawrenceville.
• Adams House, 10 1 Allentown.
• Balliettsville, 10 1 Allentown.

- Best Sta. 10 1 Allentown.
• Centre Point, 10 1 Allentown.
• Churchville Berks Co., 10 1 Allentown.
• Clayton, 10 1 Allentown.
• Corning, 10 1 Allentown.
• Cowanque Valley, 20 1 by telephone, Lawrenceville.
• Dillingersville, 10 1 Allentown.
• Eagl. ville, 10 1 Allentown.
• Fairview, Mo. tgomery Co., 10 1 Allentown.
• Fagleysville, 10 1 Allentown.
• Frauklin, Lehigh Co. 10 1 Allentown.
• Gbertsville, 10 1 Allentown.
• Harrison Valley, 20 1 by telephone Lawrenceville.
• Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.
• Ironton, 10 1 Allentown.
• Limerick Square, 10 1 Allentown.
• Lower Milford, 10 1 Allentown.
• Neffs, 10 1 Allentown.
• Nelson, 10 1 by telephone, Lawrenceville.
• New Berlin, 10 1 Allentown.
• Pleasant Corner, 10 1 Allentown.
• R-d Hill, 10 1 Allentown.
• Ruchsville, 10 1 Allentown.
• Saegreville, 10 1 Allentown.
• Schneeksville, 10 1 Allentown.
• Slatdale, 10 1 Allentown.
• Trappe, 10 1 Allentown.
• Yellow House, 10 1 Allentown.
• Zionsville Sta., 10 1 Allentown.

QUEBEC.

- Beauce Juno. Hulets Landing.
Bulwer. St. Alphonse de la Grand
Etia. Boie.

TENNESSEE.

- 292 Bellevue. 34 Withe.
292 White Bluffs.

TEXAS.

- Until further notice, the P. O. address of Antelope Boracho, Caris, Pass, ran Martin and Wildhorse will be care Supt. Telegraph, Marshall, Texas.

- 656 Antelope (South). 654 Iatan (South).
479 Bagwells. P. O. care 470 Lodi. P. O. care Eldare.
Clarksville. 655 sets (South). P. O. care
657 Boracho (South). Big Springs
652 Bremen (South). P. O. 656 San Martin (South).
care Baird. 657 Sierra Blanca (South). P.
657 Cariso Pass (South). O. care Toyah.
486 Clear Creek. 648 Trinity Mills
495 Cuero (South). 470 Wayne.
460 Forest. P. O. care Queen 500 West.
City. 657 Wildhorse (South).

- Benavides, 25 2 Corpus Christi.
• Kountz, 35 2 Beaumont.
• San Diego, 25 2 Corpus Christi.
• Village, 40 2 Beaumont.

VERMONT.

- 27 Miles Pond. Ok. et. 39 South Wallingford.
Johnsbury.
• E. Rupert, 15 2 Factory Point.
• Guilford, 10 0 by telephone, Brattleboro.
• Hartwellville, 20 1 by telephone, No. Adams, Mass.
• Jacksonville, 25 2 by telephone, No. Adams, Mass.
• North Stamford, 15 1 by telephone, No. Adams, Mass.
• Readsboro, 20 1 by telephone, No. Adams, Mass.
• Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
• Sadawga, 25 2 by telephone, No. Adams, Mass.
• Stamford, 15 1 by telephone, No. Adams, Mass.
• Wells, 15 2 Factory Point.
• West Dover, 25 0 by telephone, Brattleboro.
• Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

- 153 Roanoke.
• Lairds, (N. M.), 40 3 Richmond.
• New Market, Nelson Co., (N. M.) 25 2 Richmond.
• Salisbury, (N. M.), 40 3 Richmond.

WISCONSIN.

- 852 Haywood. 306 Spring Meadow. P. O.
839 Kempster. care Wauwatosa.
856 Livermore. 852 Superior Juno.
856 Livingston. 839 Summit Lake.
855 Turtle Lake.

NORVIN GREEN.

President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, Jan. 11, 1882.

To all Transfer Agents and offices.

The transfer service has been temporarily discontinued at Annapolis, Md.

On February 1st, 1882, a new transfer district will be established comprising the following named offices:

Class A, 2.
St. Paul, Minn.

Class B.

Bismarck, Dak. Ter, La Crosse, Wis.
Duluth, Minn. Madison, "

Fargo, Dak. Ter. Marquette, Mich.
Green Bay, Wis. Oshkosh, Wis.
Houghton, Mich. Stillwater, Minn.
Winona, Minn.

Such district will be under the direction of Isaac McMichael, of Minneapolis, Minn., to whom all transfer orders will be addressed.

NORVIN GREEN,
President.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT No. 148.—December 31, 1881.

CHARLES HENRY PATCH. JOHN W. SANFORD.

CHARLES HENRY PATCH died at Des Moines, Iowa, November 22, 1881, of Consumption. His certificate No. 1663, was issued October 22, 1872.

The above claim will be paid from surplus.

JOHN W. SANFORD died at Mobile, Ala., December 4, 1881, of Gastric Ulcer. His certificate, No. 1099, was issued March 2, 1871.

One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4036.

Insurance expires January 30, 1882; Membership, March 1, 1882.

The number of members of the Association in good standing is: 1st Division, 2164; 2nd division, 131.

Remittances will be acknowledged by Agents of the Association when postage or postal card is enclosed; and an Agent's receipt is a sufficient voucher for all dues from Members. Remit by draft, express, P. O. order, or registered letter. Money forwarded by mail or messenger will be at the risk of sender. A number of assessments may be paid in advance, to avoid small remittances.

BY-LAWS—SECTION VIII. "Upon the death of a member of the Association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and in case payment shall not be made within 30 days thereafter, the delinquent shall forfeit all claim to the benefits of the Association; and should payment not be made within 60 days, shall forfeit membership, to which said delinquent can only be restored as provided in Section VII. of these By-Laws."

N. B.—AGENTS, especially those recently appointed, are—in accordance with Section III. By-Laws—respectfully reminded that, on the expiration of thirty days from the date of an assessment, all money on hand should be remitted to the Secretary; and they will facilitate the business, and insure accuracy of the records of collections of assessments, by making their return on the first of each month for the current assessment, including all collections on previous ones not yet remitted; and on, say the 15th of the month, a supplementary remittance covering any payments subsequently received by them. By the adoption of this plan but few, if any, numbers of certificates on which assessments may have been paid will appear in the list of delinquents printed in the JOURNAL OF THE TELEGRAPH.

A. B. BREWER,

Secretary,
New York.

P. O. Box 3175.

If you want to become a telegraph operator, send twenty-five cents to O. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

PROPOSED STORAGE OF LIGHTNING.

Scientific American: A correspondent suggests that Faure batteries be connected with lightning rods to accumulate the electricity of storms. In this way, he thinks, a vast amount of electricity might be stored for mechanical uses, "with results exceeding anything ever dreamed of in perpetual motion."

There are several objections to the plan. In the first place an electrical condenser would be better adapted for the storage of the high tension currents developed in storms than the Faure battery is. The metal plates and acidulated water of the Faure battery would form so good a conductor for lightning that very little chemical work would be done in it; and it is this chemical work by the electric current which "charges" the battery, and thus prepares it for the subsequent re-development of electric energy under proper conditions. Experiments which we have made with the high tension currents developed by a Holtz machine show that such currents do have an appreciable effect upon the

Faure battery, but the quantity of energy stored is comparatively very small.

By the use of condensers lightning might be stored, but such high tension electricity is as ill adapted for the operation of mechanical motors as dynamite is a fuel for the steam engine.

Even if the sudden and violent energy of lightning could all be locked up by chemical action, and subsequently redeveloped in a quantity current, as in the Faure battery, the quantity of electricity to be had from storms is too small to pay for storage.

In one of his experimental investigations Faraday determined that to decompose a grain of acidulated water an electric current powerful enough to keep red hot a platinum wire one one-hundred-and-fourth part of an inch in thickness, must be sent through the water for the space of three minutes and three-quarters.

This quantity of electricity he shows to be equal to 800,000 charges of a Leyden battery of fifteen jars, each containing 184 square inches of glass coated on both sides, equivalent to a "powerful flash of lightning." In other words, the quantity of electricity involved in the lightning stroke—and it is quantity alone that is available for mechanical use—is very small.

In another connection Mr. Faraday demonstrates the fact that the electricity which decomposes a certain quantity of matter—a grain of water, for example—is exactly equal to that which is evolved by the decomposition of the same matter.

An ordinary galvanic cell, therefore, must evolve as large a quantity of electricity as would suffice for a respectable storm. For so small a quantity of electricity it obviously would not pay to set an expensive trap in the form of Faure batteries and lightning rods, even if the electricity of storms could all be captured that way. It would be vastly cheaper to generate the same quantity of electricity by means of galvanic batteries; and there are many cheaper sources of mechanical energy than the galvanic battery is.

ELECTRICAL CONDUCTIVITY OF MOIST AIR.

SOME electricians have held that humid air acts as a conductor of electricity; and others, notably the Count du Moncel and M. Gauguin, have maintained that it does not. Recent experiments of M. Marangoni support the latter theory very decidedly, for he finds that a Leyden jar heated so as to prevent condensation of moisture on its glass walls and thus arrest surface conduction, gives a long spark as in the driest air. When, however, the precaution of heating the walls of the jar is not taken the moisture condenses on the latter, and forming a thin film of water, causes a silent discharge which might be mistaken for a slow discharge through the conducting air. It follows from these experiments that the loss of electricity on telegraph lines is wholly due to surface conduction over the wet and dirty insulators or leakage along entangled threads and branches of trees at particular points, and not to a general discharge into the saturated air.

THE coldest place on the earth is at Verhovansk, on the River Yana, 67½°, north latitude. The lowest mean Winter temperature is 48.6° below zero, Centigrade. This, then, is the cold pole in Asia, the corresponding pole in America being to the northwest of the L'arry Islands, and the line joining these two places does not pass through the north pole itself, which it does in all probability outside of the line of greatest cold. It is noteworthy that Verkhovansk, like Yakutsk, is on the mainland, a considerable distance from the Siberian coast, which possesses a comparatively mild climate.

WESTERN UNION TELEGRAPH COMPANY,
New York, December 14, 1881.
DIVIDEND No. 58.

The Board of Directors have declared a quarterly dividend of ONE AND ONE-HALF PER CENT. upon the capital stock of this Company from the net revenues of the three months ending December 31st, instant, payable at the office of the Treasurer on and after the 16th day of January next, to shareholders of record on the 20th day of December, instant. The transfer books will be closed at three o'clock on the afternoon of the 20th of December, instant, and re-opened on the morning of the 17th of January next.

R. H. ROCHESTER,
Treasurer.

THE CHEAPEST PLACE TO BUY

PINS & BRACKETS,

In the world is from

L. B. HARRIS,

MANCHESTER, N. H.

Prices for 1,000 or less, F. O. B., as follows:

| | | |
|---------------------------------|---------|---------------|
| Plain Oak Brackets..... | \$15.00 | per thousand. |
| Painted " " " " " " | 17 00 | " " " |
| Plain " Pins..... | 12 50 | " " " |
| Painted " " " " " " | 13 00 | " " " |
| Spools for Magnets, all sizes.. | 45.60 | " " " |

Special prices for large quantities and samples furnished on application to

L. B. HARRIS,
Manchester, N. H.

TELEGRAPH AND TELEPHONE

DEPARTMENT.

POST & COMPANY

Cincinnati, Ohio

LICENSED MANUFACTURERS OF

NATIONAL

BELL TELEPHONE COS.

MAGNETO & ELECTRIC CALL BELLS, ETC.

Manufacturers of all kinds of Telephone Instruments, Bells, Plugs, Switch Boards, Annunciator Drops, Spring Jacks; Magneto-Engines for Switch Tables, and dealers in all kinds of Telephone Supplies and Tools, in stock and for sale at Lowest Prices.

Galvanized Line Wire, all numbers; Insulated Wire, all numbers. Insulators and Brackets, all sizes. Batteries, all kinds and sizes, at lowest prices.

FULL ASSORTMENT OF TELEGRAPH INSTRUMENTS.

Agents and Managers of Exchanges are requested to correspond with us before purchasing.

We call special attention to our New Improved Magneto Bells. Samples sent on application to agents and exchanges.

POST & CO., Cincinnati, Ohio.

THE

BROOK'S PATENT INSULATORS

WERE AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1867

At the Vienna Exposition, 1873

At the Cincinnati Industrial Exposition in 1874

And at the Centennial Exposition at Philadelphia in 1876

MANUFACTURED AND FOR SALE BY

DAVID BROOKS,

22 South 21st Street, Philadelphia.

Operators' Cramps cured by



LITTLE GIANT
FRENCH BATTERY

Relieves Rheumatism and all Nervous Complaints. Supersedes all others. Send for circular.

C. E. JONES & BRO.
Cincinnati, Ohio.

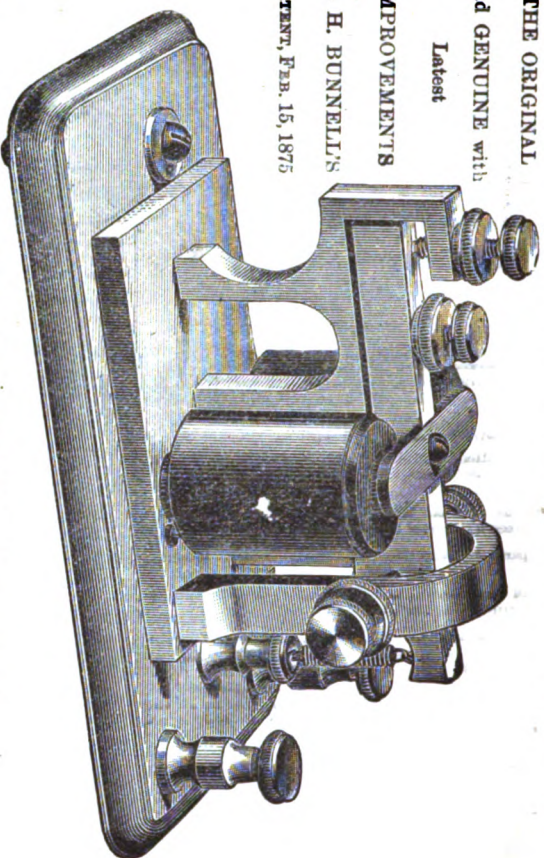
J. H. BUNNELL & CO.'S FIRST CLASS TELEGRAPH MACHINERY.

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS

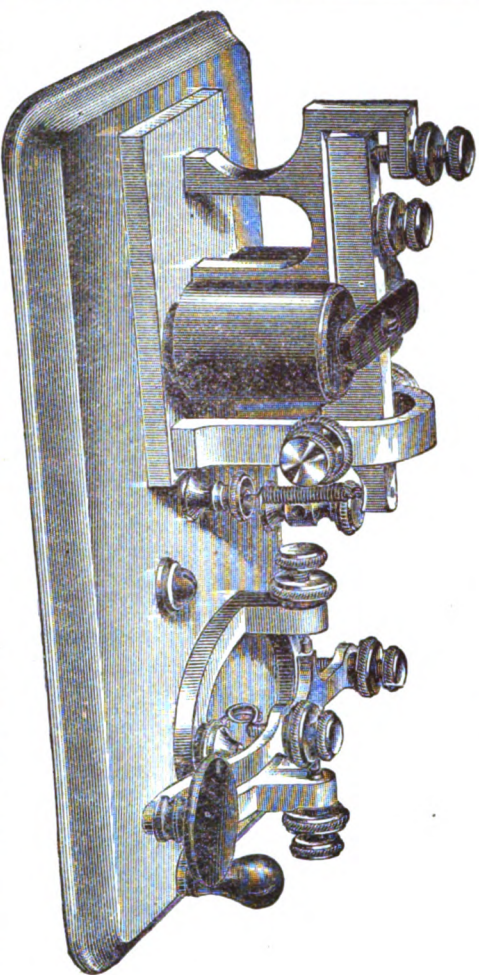
J. H. BUNNELL'S

PATENT, FEB. 15, 1875



THE GIANT SOUNDER—UNRIVALED!

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$5.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



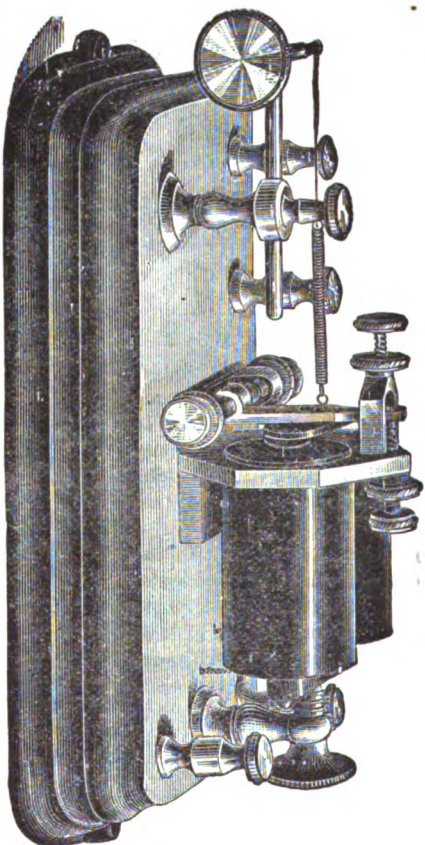
GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET:

For Private Wires, Main Lines, etc., up to 25 miles in length.—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$8.00, carefully boxed and sent by mail, prepaid, to any part of the United States.

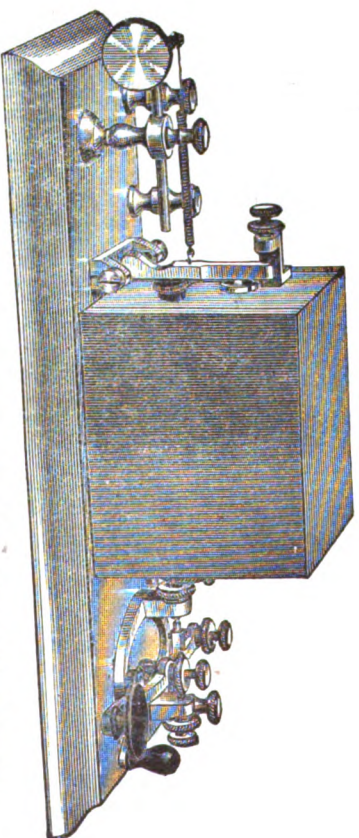
All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.



FIRST-CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Subbase, Extension Adjustment. Price, \$8.50.



BOX SOUNDING RELAY AND STEEL LEVER KEY.

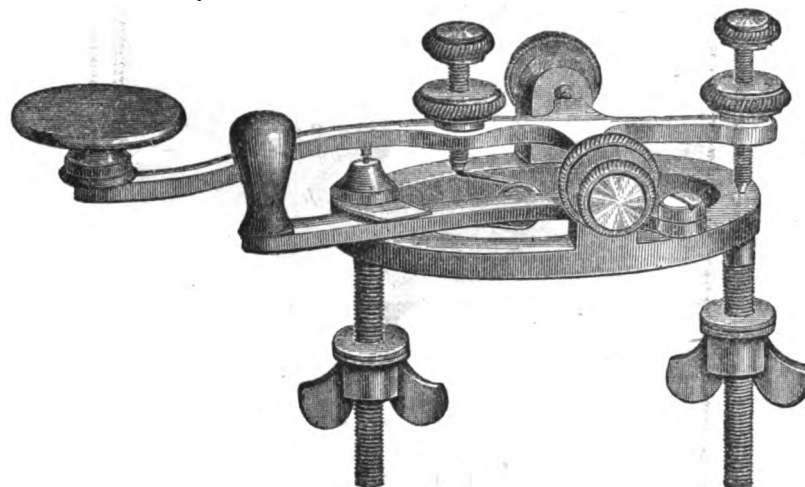
COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$12.00; without Key, \$8.00.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO.'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:


The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

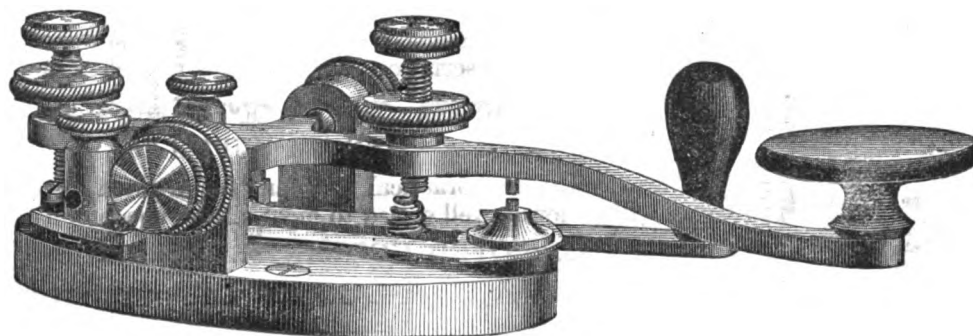
The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Legless Pattern Steel Lever Key.



A BEAUTIFUL AND PERFECT KEY,

Suitable for Use on Fine Desks or Wherever a Legless Key is Preferable.

PRICE, Carefully boxed, and sent, prepaid, by mail to any part of the United States, **\$4.00.**

J. H. BUNNELL & CO., 112 LIBERTY STREET, NEW YORK

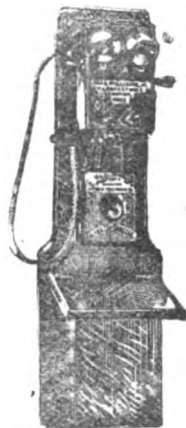
CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO



Magneto Crank and Push Button Call Bells, Electric Bells, District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS,

Batteries, Wire, Insulators and

Telephone Supplies of Every Description

GEO. WESTINGHOUSE, JR. Pres. RALPH BAGLEY, V. Pres. & Treas.
O. H. JACKSON, Gen'l Manager. ARTHUR T. ROWAND, Secretary.
HENRY SNYDER, General Agent,

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.

Sole Owners and Manufacturers of the only practically successful

SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Electricity.

Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.

Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnished upon application.

The Fitch Chlorine Battery,

Patented Sept. 16, 1879.



The Cheapest, Cleanest, most Economical, Durable, and decidedly the
BEST OPEN CIRCUIT BATTERY

in use for Telephones, Annunciators, and Electric Bells. After several years of constant use, it is pronounced to-day as being Far Superior in constancy and power to all other Batteries, for the above purposes, notwithstanding all statements to the contrary. We have made several valuable improvements in this Battery, among which is the substitution of a noncorrosive and adjustable clamp, in place of the old style lead cap, which warrants us in saying that

THE CHLORINE BATTERY has no equal in the market, and all we ask is a trial.

Price, \$1.50 per Cell.

LIBERAL DISCOUNT TO THE TRADE.

PARTRICK & CARTER,

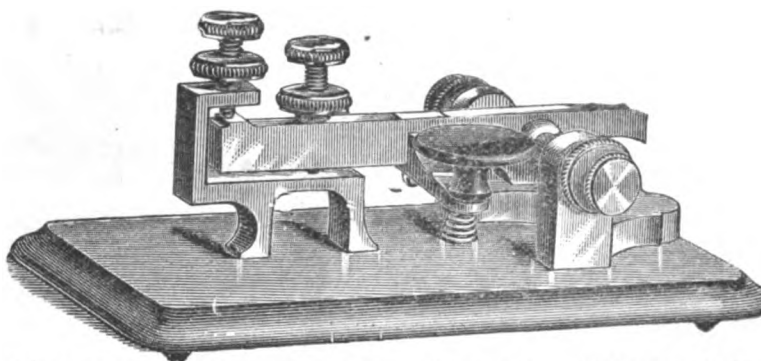
Sole Agents & Manufacturers,

114 South Second St., Philadelphia, Pa.

NEW MECHANICAL

TELEGRAPH INSTRUMENT.

PATENT APPLIED FOR.



COMBINED KEY AND SOUNDER.

NO BATTERY REQUIRED.

Works perfectly as a **KEY**, with sound equal to the best **SOUNDER**

For **MORSE ALPHABET PRACTICE** in sending and reading by sound, and for **TEACHING THE MORSE ALPHABET**. Can be carried in the pocket or a small satchel, and is *always ready for use*.

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., **\$1.50**. Sent anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or registered letter.

J. H. BUNNELL & CO.,

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

ILLUSTRATED CATALOGUES

OF NOVEMBER, 1881?

If not, send your address by postal card or letter and you will get one by return mail

IT CONTAINS

Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instruments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

Don't Read This, or you will be sure and send for our proper and to your interest to do before purchasing elsewhere. If you want to become a **Telegraph Operator** send twenty-five cents for our **new 1882 Illustrated Instruction Book**. It is the most complete instruction book published in the world.

C. E. JONES & BRO.,

Manufacturers and Dealers in Telegraph, Telephone and Electrical Supplies.

51 WEST FOURTH STREET, CINCINNATI, OHIO.

WESTERN ELECTRIC MANUFACTURING COMPANY.

230-232 KERR STREET, CHICAGO.

62-68 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES.

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANNON STAGER, President. ENOS M. BARTON, V.-Presd.

ELINEA GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE. |
|---|--------|--------|
| I—Complete Set of Catalogues..... | 286 | 20c. |
| II—Telegraph Instruments and Supplies | 64 | 6c. |
| IV—Insulated Wire (included in II) | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 32 | 3c. |
| VI—Electro-Medical Apparatus..... | 32 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 32 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 3c. |
| XI—Magnets for Mills..... | 20 | 3c. |
| Str Wm. Thomson's Nautical Instruments.... | 24 | 5c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK,

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,

AND

PLAIN AND OILED WIRE OF SUPERIOR QUALITY,

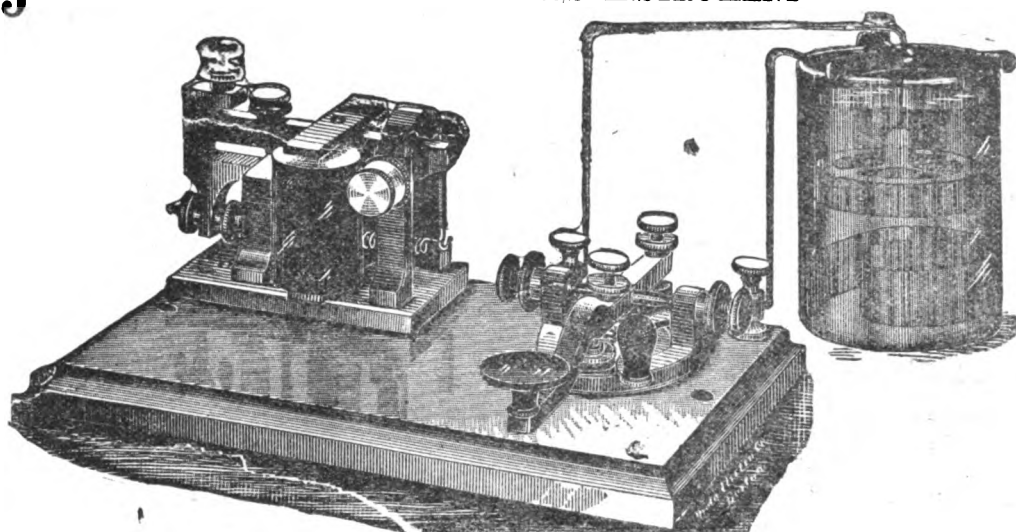
FROM SWEDISH CHARCOAL AND B B IRON.

BUT ONE JOINT PER BUNDLE.

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT



PRICE FOR THE COMPLETE "GEM" LEARNERS' OUTFIT, \$4.20

Consisting of the above large-sized Sounder and Key, a good Cell of Calland Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument made that has nicely finished brass Sounder and Key Levers with perfect adjustments for both.*

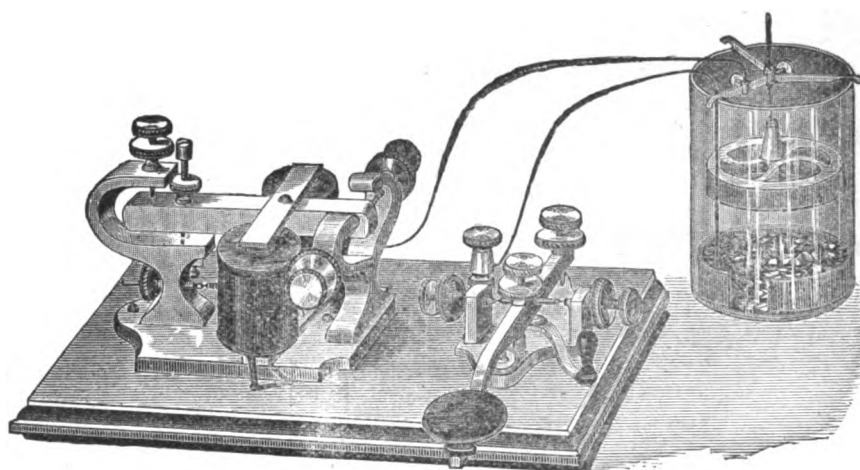
| | | | |
|---|--------|--|--------|
| Price for Complete Outfit | \$4.20 | Price for Instrument alone, for lines 1 to 15 miles .. | \$4.00 |
| " " Instrument alone | 3.40 | " " " " " " " " " " | |
| " " Instrument alone, by mail, postpaid ... | 4.00 | by mail, postpaid..... | 4.50 |

SEND FOR CIRCULAR.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,

No. 80 HANOVER STREET, BOSTON, MASS.



No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of Sounder, Key, either on 1 base or separate, 5x7, Calland Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent O. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

A. B. LYMAN, 36 South Water St., Cleveland, O.

PARTRICK & CARTER

TELEGRAPHIC SPECIALTIES.

THE GIANT SOUNDER PERFECTED.

Patented Feb. 16, 1875. Most perfect, reliable, clear toned; fine finish, and warranted the best working sounder in existence. Price, by mail, \$5.00.

THE "LATTIG" AUXILIARY LEVER NON-STICKING KEY.

PATENTED AUGUST 16, 1881. PRICE, \$4.00, BY MAIL.

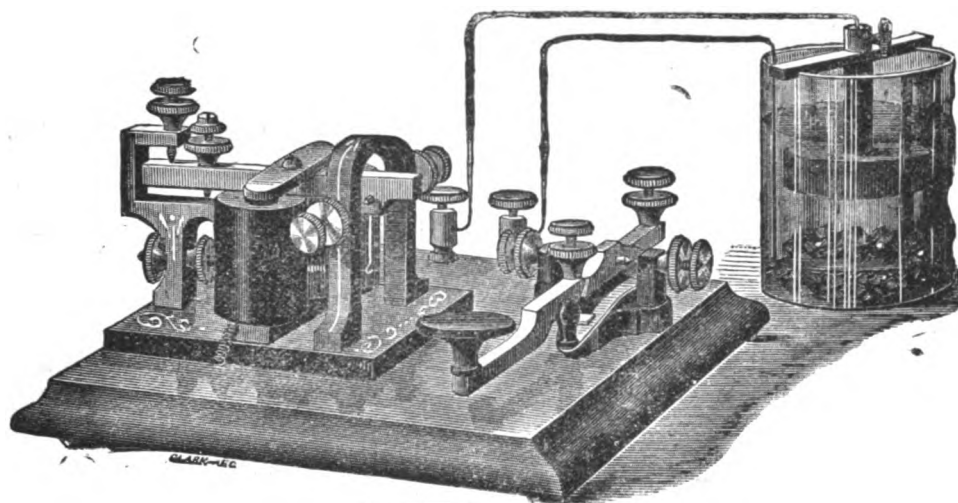
This Key is very fine finish nickel-plated, and presents a beautiful appearance, is easy to handle and WARRANTED NEVER TO STICK. It has been extensively tried and has received the endorsement of the best operators in the country. It embodies the only true principle to prevent a Key from sticking by having a great separation between the anvil and hammer, (without increasing the play of the Key lever), thereby preventing the formation of the "Electrical Arc" between the platina points, which is the PRIMARY CAUSE OF STICKING KEYS. We claim this Key will never fail to make contact.

"THE EXCELSIOR KEY." (PATENT APPLIED FOR.) PRICE \$2.50 BY MAIL.

This Key is made ENTIRELY OF BRASS NICKEL PLATED, with hardened platina points, and it is put forward to meet the long existing demand for a CHEAP, LIGHT, EASY WORKING, FIRST CLASS KEY, and is without doubt the CHEAPEST and BEST KEY EVER OFFERED FOR THE MONEY.

Premium Learners' Apparatus.

Only \$5.00. Not the Cheapest, but Guaranteed the Best.



The PREMIUM LEARNERS' APPARATUS and OUTFIT comprises the famous "NEW GIANT SOUNDER, PERFECTED," and "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Callaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5.00, when the money accompanies the order. The great number of these Instruments now in use is the best testimonial that can be offered.

Price, Complete Outfit.....Money in advance, \$5.00
" Instrument without Battery....." " 4.30
" Instrument without Battery, by Mail....." " 4.75
Remittances should be made by P. O. Money Order, Registered Letter, Draft or Express, which will insure safe delivery. Send for circulars.

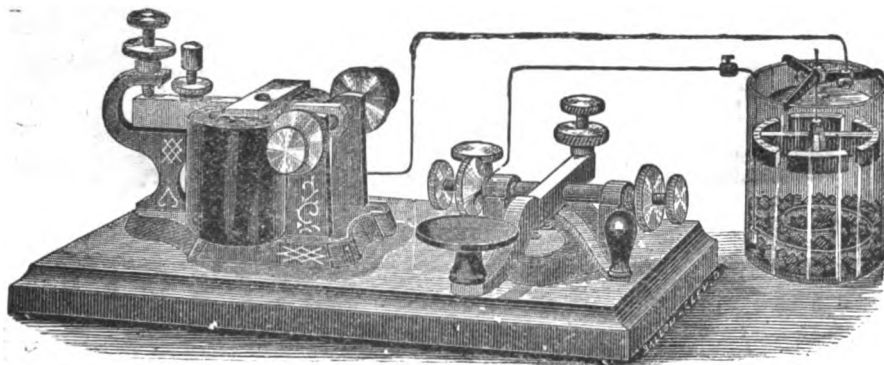
PARTRICK & CARTER,

No. 114 SOUTH SECOND STREET, PHILADELPHIA, PA.,

Manufacturers and Dealers in TELEGRAPH, TELEPHONE, AND ELECTRICAL INSTRUMENTS AND SUPPLIES OF EVERY DESCRIPTION. Send for Catalogues and Circulars.

SEND FOR OUR PRICES BEFORE PURCHASING ELSEWHERE.

EUREKA OUTFIT NO. 2.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

THE ABOVE OUTFIT AND MATERIAL ALL COMPLETE SENT ON RECEIPT OF \$4.25.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circulars.

M. A. BUELL & SONS,

Room 19, Leader Building, Cleveland,

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

2,164 MEMBERS. \$21,640 RESERVE FUND.

The Association respectfully invites attention to its success during the past ten years, having paid to its beneficiaries over \$175,000, and accumulated a reserve fund of \$21,640, interest upon which nearly pays current annual expenses. No officer or agent draws salary or commission. Average annual assessments to each member has been less than \$12.

Any person, of either sex, in good health of not less than 18 or more than 45 years of age, who is employed in telegraphic service, and is otherwise qualified as required by the By-Laws, is eligible to membership; and should a member in good standing leave the Telegraphic Service, but continue to pay all dues assessed and otherwise conform to the Constitution and By-Laws, he can retain his membership.

The initiation fee is \$2. \$1,000 will be paid to the beneficiary of a deceased member within 60 days after verification of claim; and in the case of a member who has been one year, next preceding date of death—in good standing, the claim is indisputable.

Any one who is or becomes a member in good standing of this Association is also eligible to membership in the new or Second Division. For further information, copies of Constitution and By-Laws, blank applications, etc., apply to any of the following named officers or agents:

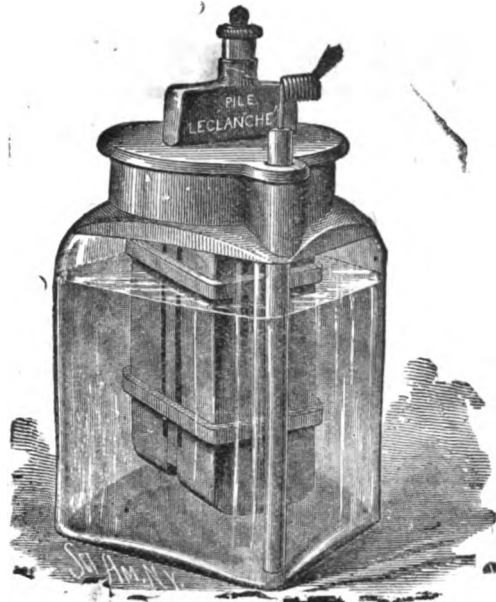
OFFICERS:
CLARENCE GARY, President. O. H. SUMMERS, Vice-President.
A. R. BREWER, Secretary. SAMUEL M. TAYLOR, Treasurer.
EXECUTIVE COMMITTEE:
CLARENCE GARY, New York. O. H. SUMMERS, Chicago, Ill.
A. R. BREWER, New York. SAMUEL M. TAYLOR, New York.
W. H. YOUNG, Washington. D. C. F. W. JONES, New York.
JOHN E. ZWILLER, Phil. Pa. CHARLES S. H. SMALL, New York.
JAMES MERRICK, New York.

AUDITING COMMITTEES:
H. C. ROBINSON, Philadelphia, Pa. T. F. SCULLY, New York.
R. W. POPE, New York.

AGENTS:
Albany, N. Y. Charles O. King.
Angusta, Ga. John W. Brown.
Atlanta, Ga. J. M. Stephens.
Baltimore, Md. R. J. Bigham.
Bangor, Me. H. C. Bliss.
Bismarck, Dak. E. C. Greene.
Boston, Mass. E. B. Rumsey.
Buffalo, N. Y. J. W. Tillinghast.
Cheyenne, W. T. Chas. F. Annett.
Cincinnati, Ohio. G. W. Sheppard.
Chattanooga, Tenn. Charles H. Skelton.
Charleston, S. C. J. D. Hester.
Chicago, Ill. J. Uhrig.
Cleveland, Ohio. H. L. Melton.
Columbus, Ohio. C. W. Ross.
Denver, Col. W. B. Rundle.
Dubuque, Iowa. F. I. Benson.
Detroit, Mich. T. W. Hill.
Elkhart, Ind. S. P. Wilson.
Evansville, Ind. N. M. Booth.
Grand Rapids, Mich. E. D. Benedict.
Galveston, Texas. David Hall.
Grafton, W. Va. A. T. Glines.
Harrisburg, Pa. H. A. Chase.
Haltax, N. B. Alex. E. Hoyt.
Hartford, Conn. S. E. Curtis.
Indianapolis, Ind. F. A. Moore.
Jackson, Mich. D. S. Fleming.
Jackson, Tenn. Nelson M. Jacobs.
Kansas City, Mo. M. D. Wood.
La Fayette, Ind. H. M. Doolittle.
Little Rock, Ark. E. C. Newton.
Louisville, Ky. Charles Smith.
Mobile, Ala. B. F. Shreve.
Montgomery, Ala. B. Winter.
Memphis, Tenn. C. Kelly.
Milwaukee, Wis. D. E. Henshaw.
Montreal, Quebec. James Kent.
Nashville, Tenn. A. H. Stewart.
New Haven, Conn. J. M. Fairchild.
New Orleans, La. J. T. Allyn.
No. Sydney, O. B. Nathl Martell.
New London, Conn. G. W. Russell.
N. Y. L. Erie & W. R. R. (21 Cortlandt St. N. Y.) O. D. Reed.
Oil City, Pa. Frank Ross.
Omaha, Neb. L. M. Rheim.
Philadelphia, Pa. Wm. G. Jones.
Phillipsburgh, N. J. G. H. Grace.
Peoria, Ill. J. E. Hannev.
Pensacola, Fla. C. L. Baron.
Pittsburgh, Pa. J. E. Palmer.
Poughkeepsie, N. Y. S. K. Mupley.
Portland, Me. C. D. Livermore.
Portland, Oregon. D. F. Leahy.
Providence, R. I. Edgar M. Dexter.
Reading, Pa. W. H. Runyon.
Richmond, Va. W. O. Walstrum.
Rochester, N. Y. A. J. Stoddard.
Reno, Nevada. Frank Bell.
Sayre, Pa. H. H. Hamilton.
Scranton, Pa. R. O'Brien.
Syracuse, N. Y. Luther G. Field.
St. John, N. B. R. T. Clinch.
St. Louis, Mo. W. H. Stanton.
St. Paul, Minn. Day E. Smith.
San Francisco, Cal. A. P. Dubois.
Savannah, Ga. H. Griffith.
Springfield, Mass. W. J. Denver.
Springfield, Ill. W. W. Kelchne.
Toronto, Ont. J. Lanckall.
Troy, N. Y. F. D. Adams.
Toledo, Ohio. J. P. Church.
Vincennes, Ind. Perry Hood.
Washington, D. C. W. H. Young.
Wheeling, W. Va. Jno. G. Tomlinson.
White River Junction, Vt. G. W. Gates.
Wellsville, Ohio. P. Bruner.
Worcester, Mass. E. W. Bradford.
Watertown, N. Y. D. Van Nostrand.

A. R. BREWER, Sec'y.

P. O. Box 5175. New York,
W. U. T. Building, Room 52.

LECLANCHE BATTERY. (Patented.)**THE GREAT 'TELEPHONE BATTERY.**

THE REFINEMENT OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company,
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones.

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Plaques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of IMITATIONS and WORTHLESS Imitations.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity Zinc and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,

40 West 18th St., New York.

Or L. G. TILLOTSON & CO.,

5 & 7 Dey Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FIBBER

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLES, ETC.

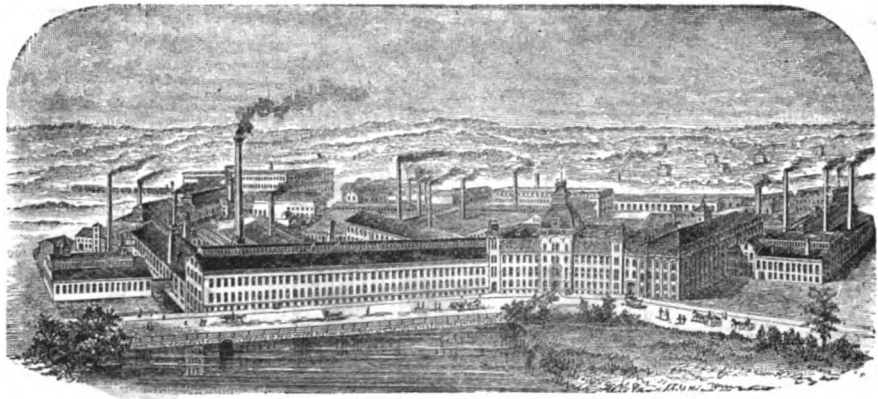
OFFICE AND FACTORY: 67 STEWART STREET.

PROVIDENCE, R. I.

W. H. SAWYER, Electrician and Sup't.

TELEGRAPH WIRE.**TELEPHONE WIRE.****WASHBURN & MOEN MANUFACTURING COMPANY.**

ESTABLISHED 1861. CAPITAL \$1,800,000.

**WORCESTER, MASS.**

21 OLIVY STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequaled in that particular.

Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,
(In connection with the DOUBLE SHEET FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.
N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

KERITE INSULATED**TELEGRAPH WIRES AND CABLES**

KERITE IS INDESTRUCTIBLE.

FIVE YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

in earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession

THE

DURABLE QUALITIES OF KERITE

RECOMMENDED BY THE

CHEAPEST AND MOST ECONOMICAL

insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation furnished at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

2 HOTOSHIMA, General Agent.

**THE AMERICAN
BELL TELEPHONE COMPANY.**

W. H. FORBES, President, W. K. DRIVER, Treasurer,
THOS. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telephone Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

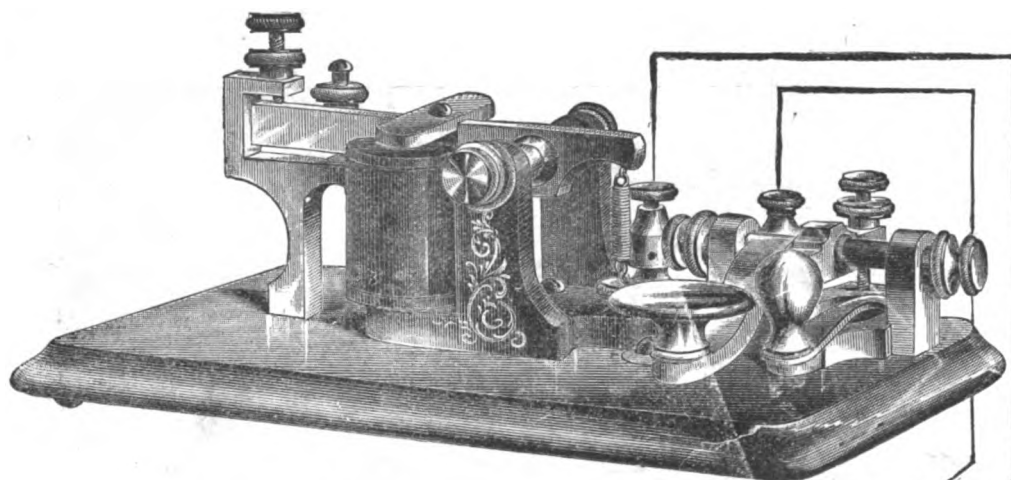
We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

The "Morse" Learners' Instrument.

THE BEST.



THE BEST.

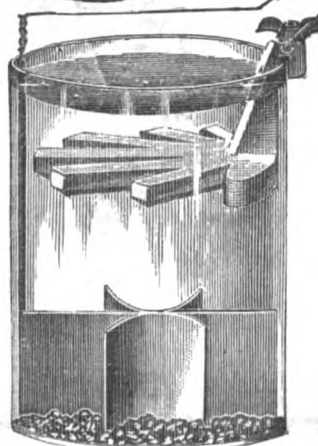
Price, \$450, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.

| | |
|---|--------|
| "Morse" instrument alone, without battery..... | \$3.80 |
| "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... | 4.50 |
| Cell of battery complete..... | .65 |
| "Morse" Learners' Instrument, without battery, sent by mail..... | 4.30 |
| (Battery cannot be sent by mail.) | |

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



THE "MORSE"

Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners' Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

You are **SURE** of getting
THE BEST THAT IS MADE

IF YOU SELECT THE "MORSE."

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.

ESTABLISHED 1820.

ALFRED F. MOORE,

[SUCCESSOR OF JOSEPH MOORE & SONS]

MANUFACTURER OF

INSULATED TELEGRAPH WIRES,

200 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

INSTRUMENT AND OFFICE WIRES. FLEXIBLE CORDS. ARMUNGATOR
AND BURGLAR ALARM WIRE. ELEVATOR CABLES.

All wire used is thoroughly tested for conductivity, therefore
ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP,

FOR FLEXIBLE CORDS.

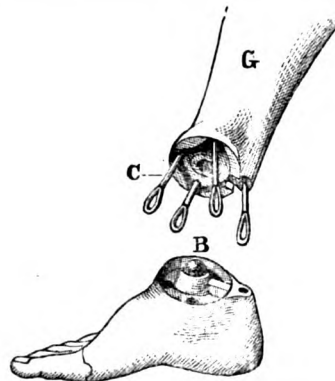
Descriptive Circulars furnished upon application.



CARDS! CARDS!!

Your name finely printed on 15 Bevel Gold-edge Cards, with or without a small Key or Pigeon Embellishment engraved on the upper turn-down corner, for 25 c.; or, 75 with address, if desired, for \$1.00; or 25 assorted Electrotype Cards of Keys, Sounders, Relays, &c., for 20 c. 25 Embellished Keys, 20 c. 25 Transparent Picture Cards, new and rich, 20 c. 25 Tinted Portraits of Actresses, (Bernhardt, &c.), no name, 20 c. 25 side-splitting Comic, no name, 20 c. 25 laughable Flirtation Cards, 20 c. One Russia Card Case, two pockets, 20 c.; Morocco, 10 c. Samples of Cards, 10 c. We have the Bevel Gold-edge Cards, engravings for nearly all kinds of business. You can make money by selling them in your town, as all business men will appreciate them. Samples and terms, 10 c. Silver wrapped in paper comes safely. Address

F. P. MUNN, CLYDE, Wayne Co., N. Y.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.

GEO. B. FULLER,
Successor to DR. D. BLY, Rochester, N. Y.

BEST TELEPHONE EXCHANGE SWITCH BOARD.

IN THE WORLD.

SUPRSEDING ALL OTHERS.

Sample and Circulars sent to Exchanges on
Application to

C. E. JONES & BRO.,

CINCINNATI, OHIO.

WESTERN

SCHOOL OF TELEGRAPHY.

JANESVILLE, WISCONSIN.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement, now of five years standing, with the system of city lines in Chicago known as the Metropolitan Telegraph Company, having over 100 offices, and worked in connection with lines to all parts of the country. These city lines draw their operators from this school, placing them first in sending offices and afterwards promoting them according to merit. The superintendents of telegraph of the different railroads centering at Chicago, employ many men from the city lines, and the leading telegraph companies do the same, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make of our students first class operators, nor to obtain for them first class situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

RICHARD VALENTINE, } MANAGER.
A. M. VALENTINE, }

N. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have lately furnished the following Companies in this way, to whom we refer: Wisconsin Central, Green Bay & Minn.; St. Paul Minneapolis, & Manitoba & Chicago; St. Paul, M. & Omaha,

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, FEBRUARY 1, 1882.

WHOLE NO. 342.

GROVE'S, PLANTE'S, AND FAURE'S SECONDARY BATTERIES.

BY PROF. W. GYLLS ADAMS, F.R.S.

At the recent opening meeting of the King's College Scientific Society Prof. Adams read a paper on this interesting subject. The first part of the paper was principally historical, showing that the effects on which the action of secondary batteries depend have been known since the beginning of the century. Volta discovered his battery in 1800, and in 1801 Gautherot observed the action usually ascribed to polarization. In 1803, Ritter, of Jena, also observed the phenomenon, and devised a battery for making use of the currents. Volta and Marianini, and afterwards Becquerel, investigated the action. Grothius, in 1805, and Sir Humphrey Davey, in 1806, attempted to explain the phenomena, as did De la Rive in 1825. In 1833 Faraday attacked the subject, and set the whole theory of electrical decomposition on a firm basis in his four series of papers communicated to the Royal Society between June, 1833, and March, 1834. Prof. Adams described the work of Faraday and the laws of electrolysis deduced from this work. "The chemical power of a current of electricity is in direct proportion to the absolute quantity of electricity which passes." Faraday powerfully reasons as to the identity of Voltaic and machine electricities. He says:

"One grain of water, acidulated to facilitate conduction, will require an electric current to be continued for three minutes and three quarters of time to effect its decomposition, which current must be powerful enough to retain a platinum wire 1-104th of an inch in thickness, red-hot, in the air during the whole time; and if interrupted anywhere by charcoal points, will produce a very brilliant and constant star of light. If attention be paid to the instantaneous discharge of electricity of tension, as illustrated in the beautiful experiments of Mr. Wheatstone, and to what I have said elsewhere on the relation of common and voltaic electricity, it will not be too much to say that this necessary quantity of electricity is equal to a very powerful flash of lightning. Yet we have it under perfect command; can evolve, direct, and employ it at pleasure; and when it has performed its full work of electrolyzation, it has only separated the elements of a single grain of water."

Subsequently Professor Adams said: He (Faraday) may almost be said to have discovered a secondary battery similar to that of M. Planté's or M. Faure. When using acetate of lead for his solution he finds that the results at both electrodes are peroxide of lead appearing at the positive and lead itself at the negative pole.

In 1843 Grove made an important addition to the problem when he invented his gas battery, which Professor Adams discussed at some length, afterwards referring to the units adopted for the various

measurements required in relation to this subject. The latter part of the paper was devoted to the consideration of the question of storage of electrical energy.

We may store up electrical energy of very high potential in a Leyden jar or condenser, and make use of it at intervals, instead of taking it continuously from an electrical machine. We cannot raise the potential of the charge in the Leyden jar any higher than the potential of the machine from which it is charged. We may as well expect heat to flow from a cold body to a hot one and make it hotter, or think that we can get water of its own accord to flow up a hill into a reservoir at the top. In connection with this question of storage of energy it may help us to trace the analogy between difference of potential with regard to electricity and difference of level with regard to the force of gravity. The difference of potential giving rise to electromotive force between two points which are united by a conductor causes a current of electricity from a point of higher to a point of lower potential, just as a difference of level giving rise to pressure between two points in a water channel causes a flow of water from the higher to the lower level. The electromotive force corresponds to pressure, and the resistance of the circuit corresponds to the hindrances to the flow; the current corresponds to the quantity of water flowing per unit of time. Thus, of two paths from one level to another, the current will be most rapid along the steepest channel, and in the same way with the same electromotive force, the greatest current will be along the line of least resistance.

The electricity supplied by the electrical machine will be like a very small stream supplied by a pump at a very great height, and discharging itself by a small pipe at a very much lower level, so that it is capable of exerting very great pressure, but when allowed to run it can do very little work because the quantity is small. The Leyden jar is like the reservoir into which the water is pumped at a high level, and when the size of this reservoir is increased we know how difficult it is to prevent leakage from the very great pressure exerted by the water, and how dangerous the bursting and discharge from such a reservoir may be to those on the lower level who may happen to be on the path of the discharge.

On the other hand, the ordinary Grove battery, which gives us electricity in abundant quantity, but of small difference of potential, is like a means of obtaining, when required, an ample supply of water as from a large reservoir not far above the level when it is wanted to be used, and so giving an abundant supply at low pressure. Had this mode of supplying electricity continued to be the principal one, we should, probably, not have so much need, and should not hear so much of secondary batteries; for, instead of burning up the zinc in the Grove battery to charge up the secondary bat-

tery like a large reservoir to-day, in order that the stored-up electricity may be used to-morrow, it would, probably, be better not to charge the Grove battery until to-morrow, and then use it directly to do the work required.

The development of Faraday's discovery that the motion of a coil of wire in front of the poles of a magnet or in a magnetic field gives rise to an electric current in the wire, has shown us that the burning of zinc or other materials in batteries such as Grove's or Daniell's is a very expensive way of producing an electric current, and that it is far more economical to obtain electric currents by employing the best mechanical means we have to produce rotation of the coil of wire in the magnetic field. The different magneto and dynamo-electric machines (and they abound) are but the results of attempts to find the best form of coil, the best kind and best form of magnets, the best proportion of resistances, and the most suitable arrangements for the special work in each case which is required to be done. The dynamo electric machine, driven by a steam engine or by a gas engine, is very satisfactory as a mode of producing electricity, and both the electromotive force and the current increase with the rate of rotation of the coil. This mode of producing electricity is like raising water to any level that may be required in each particular case; but the electricity must be used at once whilst the steam engine, or the gas engine, is in action. This may be very inconvenient, and hence the necessity for something like a reservoir to store up the electricity. The labors of Faraday have shown us the relation between the quantity of electricity and the weights of the chemical elements decomposed by it in an electrolyte, and that these chemical elements may unite again to reproduce the same quantity of electricity. The object, then, to attain by means of secondary batteries is to find some substance which can be decomposed into two others which will remain apart, even when joined by a liquid conductor, until a complete electric circuit is made. Then these two substances should be at considerable difference of potential, so as to give a strong electric current in uniting again to form the substance from which they were decomposed.

In 1859, M. Planté, taking advantage of the great affinity of peroxide of lead for hydrogen, made use of this substance to increase the effects of secondary batteries, and so was led to make use of lead electrodes instead of platinum, which had been the metal hitherto employed. He found that better results could be obtained with one cell with lead electrodes, than with two cells with platinum electrodes. So from this battery, plates of lead with a finely divided layer of lead upon them are taken as electrodes. A current from 2 Grove cells is sent through the cell containing them, immersed in dilute sulphuric acid of strength about 1 to 10. The current is sent for a quarter of an hour in one direction, then the cell is fully discharged, the cur-

rent from the primary battery is then sent through it for a quarter of an hour in the opposite direction, after which the cell is again discharged. In this way it is charged over and over again in opposite directions for longer and longer periods, care being taken each time that the secondary cell is fully discharged. Then the battery is again charged, but when it is capable of giving out the charges slowly enough for the purpose for which it is to be used, then the successive chargings should no longer be given in opposite directions, but always in the same direction. We may say that after the battery is formed, it should always be charged in the same direction.

In charging by sending a primary current through the cell, peroxide of lead is formed at the positive pole, and the negative pole becomes somewhat crystallised. When detached, the peroxide of lead forms the positive pole of the secondary battery, and the battery will remain in action until the two plates return to the same state, the positive pole being reduced from the peroxide to the oxide of lead, and the negative pole being transformed from lead to the oxide of lead.

M. Planté has especially aimed, by means of his battery, to convert electricity obtained from an ordinary battery into electricity of high tension, to do in a smaller degree what is done by means of the Ruhmkorff induction coil. By means of two cells of Grove or Bunsen he can charge a great number of cells, a dozen or more arranged, for quantity, i.e., with all their positive poles together and all their negative poles together, and when they are charged by arranging them in series, i.e., with the positive pole of one joined to the negative pole of the next, he can get great electromotive force, and at the same time obtain electricity in great quantity.

By his battery of 800 cells, which he has set up in Paris, and by the aid of his rheostatic machine, which I have not time to describe, he can imitate lightning discharges and remarkable luminous effects, somewhat analogous to the brilliant effects of the aurora borealis.

(To be Continued.)

PROTECTION TO SUBMARINE CABLES.

The following memorial has been presented in England to Lord Granville, the Secretary of State for Foreign Affairs:—

London, December 12, 1881.

"MR. LORD: For some years past there has been an increasing recognition of the fact that submarine cables need protection from careless and wilful damage, and that the repairing operations necessarily consequent upon interruptions call in like manner for protection from careless and wilful interference. In the shallow waters of the Channel, the Irish Sea, the German Ocean, the Baltic, on the Newfoundland Banks, the bank along the coast of Nova Scotia, and in Massachusetts Bay interruptions sustained by submarine cables are, almost without exception, owing to damage occasioned by anchors and trawls; and wherever cables land all over the world, according to the greater or lesser number of ships frequenting the coast, breakages from anchors are more or less numerous. In like manner, in all comparatively shallow waters where there is fishing with anchors, trawling or trawling, the cables are broken or damaged so as to be rendered unworkable. In all these cases the cables are laid down on the charts, and might consequently be avoided. The precise manner in which these interruptions in shallow waters are caused may be concisely stated as follows:—By ships carelessly an-

choring on the line of the cable or in dangerous proximity. By ships carelessly dragging their anchors across the line of the cable. By fishing boats fishing with an anchor out to direct their course, and trailing across the cable. By trawlers trawling with equal carelessness across the cable. By the use of badly repaired trawls, or trawls out of repair, with projecting bolt heads clumsily attached, sharp edged pieces of iron, and so on, which drag along the cable and injure it, thus destroying communication through it. By the wilful action of the crews of both ships and trawlers, who, when they find their tackle caught by the cable, bring the latter to the surface, and, instead of clearing it properly and letting it down to the bottom again, free their tackle by cutting the cable asunder. By ships navigating near cable steamers, both in cable-laying and cable-repairing expeditions. This danger has been much increased from a removable cause, which will be more fully dealt with further on.

"When the cables are found to be interrupted, and the locality of the fault has been ascertained by electrical tests, cable-repairing ships are sent out to effect the repairs, and their proceedings are carelessly and wilfully interfered with and impeded by the proceedings shortly described as follows:—By fishing boats casting their nets so as necessarily to drift across the buoys and cable ships employed in repairing operations, thus delaying or rendering them for the time impracticable. By the destruction, carelessly or wilfully, of buoys attached to cable ends or anchored as mark buoys during repairs. By wilfully unshackling buoys and setting them adrift. These two latter proceedings, as often as they are repeated, render it necessary to go over all the work again. It would appear to be quite apparent that there can be no necessity for ships and fishing boats to drop anchor or fish along the bottom in dangerous proximity to cables when the whole sea and coast line are open. It would appear to be equally apparent that there can be no necessity for fishing boats to cast their nets in the direct line of cable repairing ships and buoys so as inevitably to drift down upon them. It must be apparent, on the other hand, that the cable ship is confined to particular ground; because it is there the cable is damaged or broken, and it is there, consequently, that she is compelled to work. That the ships employed are cable ships, and that they are employed upon cable work, is known, because the ships carry distinctive signals both by day and night. The position and course of a cable are equally known, because they are carefully laid down on the charts, and in many places in addition, the course is given on shore by notice boards on the buildings about the harbor where mariners and fishermen congregate.

"The companies are of opinion that long immunity has allowed the careless and wilful proceedings described to grow almost into a system, although in many instances the parties occasioning damage themselves suffer. Probably the mischief originated in mere carelessness and thoughtlessness, inasmuch as there has been no actual prohibition of the proceedings described, and there has been no penalty to attract attention to disagreeable and discreditable consequences arising from these careless and wilful acts. Captains have probably unthinkingly dropped anchors where found merely convenient, and fishermen have cast their nets simply without reflection, when, as the natural result, the wilful damage to the cable has followed from a feeling of exasperation. But the captain may suffer a day's detention to his ship or lose his anchor or chain, the fisherman may have their nets entan-

gled, and lose a day's fishing or more, owing to their fouling cables, ship or buoys. Consequently international provision would be alike protective of the real interests of the mercantile marine and of the fisheries, as well as of the telegraph companies. If their causes be not checked, the interruptions and consequent irregularities of the telegraph service, which are already very damaging to commercial interests, threaten to become more so, and it must be advantageous from all points of view to diminish their frequency. The additional outlay, directly and indirectly occasioned, and the losses of revenue caused, press heavily upon the companies. The capital invested, now amounting to £25,000,000, is unfavorably affected, and the whole system, as described, operates to discourage those enterprising investors who have placed this country beyond question at the head of telegraphic enterprise.

"In soliciting the support of such a form of protection as the government may devise and believe to be attainable, the companies desire to lay stress more especially upon the points hereinbefore described. There are, however, two other matters which they venture to bring forward, and relative to which something might, perhaps, be done in the way of recommendation. During repairs, when personal communication with the shore at cable ends is necessary, this is prevented by quarantine regulations. In the West Indies the work of repair has been much facilitated by personal communication having been permitted under the surveillance of a quarantine officer, and the same has been done in the Levant by Greece; a general recommendation to countries to offer facilities such as above described would doubtless result in such facilities being afforded. The companies also would venture to ask that it might be made a recommendation to governments to admit cable-repairing steamers to some kind of exemption from ordinary Custom-house regulations, light and harbor dues. These ships do not carry any kind of mercantile commodities or produce. They are solely engaged in maintaining submarine lines of international communication. They have frequently to enter harbor for shelter, and for the purpose of readjusting their stock of cable and refitting their lost cable, gear and stores. On a recent occasion, when one steamer was obliged to enter a harbor in Spain to obtain from another ship a fresh supply of cable, permission to transfer the cable was absolutely refused, so that either the ship had to return to Lisbon, her last clearance port for fresh papers, or both ships had to put to sea outside Custom House jurisdiction, to enable them to transfer the cable, which they did. These circumstances delayed repairs for several days to a most important line of communication.

"A new and serious danger has recently become apparent, which, in addition to the inconvenience and damage which cable-repairing ships may sustain from its continuance, can hardly fail to result in the neglect and abandonment of ships in actual distress. The Board of Trade require that steamships which are not under control must carry three red lights, one above the other, and cable ships while engaged in grappling consequently have to carry these lights. It is the practice of passing steamships when they observe the 'not under control' signal, to assume that it is made by a disabled steamer signalling for assistance, and with the object of rendering aid they approach the cable-repairing steamer to their own danger from the buoys and from the cable which is being repaired, either of which might disable propellers and rudders by entanglement. A still more serious disaster might occur should the commanders of steamships learn to assume that signals indicating a ship 'not unde-

control 'mus' belong to a cable-repairing ship, for a sinking steamer might have used all her rockets and be reduced to the 'not under control' signal as the only means of attracting attention. Passing vessels might disregard the signal, believing it to proceed from a cable-ship, conducting her ordinary operations; consequently this identity of signals, for entirely different purposes, might be the actual cause of a sinking ship being unwittingly neglected and left to sink. The attention of the Board of Trade has been several times drawn to this danger.

"There has been a difficulty in point of time in procuring statistical information which would greatly tend to strengthen the representations made in this letter, but this may hereafter be furnished, if, in your lordship's opinion, it be desirable. The companies therefore now earnestly beg that your lordship may be pleased to take such steps, with the view of placing submarine cables under the protection of international law, in view of the careless and wilful damage they are now subject to, as your lordship may deem most fitting. The companies have not asked, and do not propose to ask, for the neutralization of submarine cables in time of war, as such a request would open up, not a question of mere international police, so to say, but considerations of such great imperial magnitude that any result would in all probability be indefinitely postponed. The companies further beg that your lordship may be pleased to receive a deputation representing the interests involved at such convenient time as your lordship may appoint.

"We have the honor to be your lordship's most obedient humble servants.

"Anglo-American Telegraph Company—**MONCK**, Chairman; **H. WEAVER**, Managing Director.

"Black Sea Telegraph Company, Eastern Telegraph Company, Eastern extension, Australasia and China Telegraph Company, Eastern and South African Telegraph Company—**JOHN PENDER**, Chairman; **JAMES ANDERSON**, Managing Director.

"Brazilian Submarine Telegraph Company—**THOMAS FULLER**, Managing Director.

"Cuba Submarine Telegraph Company—**THOMAS HUGHES**, Chairman; **JAS. SCOTT**, Secretary.

"Direct Spanish Telegraph Company—**NIEL BARNATTY**, Chairman.

"Direct United States Cable Company—**J. FULLER**, Secretary.

"German Union Telegraph Company—**GERMAN UNION TELEGRAPH AND TRUST COMPANY (LIMITED)**.

"Globe Telegraph and Trust Company, London, Platino and Brazilian Telegraph Company—**JOHN PENDER**, Chairman; **W. PAXTON**, Secretary.

"Great Northern Telegraph Company—**H. G. ERICHSON**, R-presentative in England.

"Indo-European Telegraph Company—**J. HOLLAND**, Chairman; **W. ANDREWS**, Managing Director.

"Mediterranean Extension Telegraph Company—**E. TOMBS**, Secretary.

"River Plate Telegraph Company—**GEORGE W. CLARK**, Chairman; **JOHN MANN**, Secretary.

"Submarine Cables Trust—**LEWIS WELLS**, Secretary.

"Western and Brazilian Telegraph Company—**ALAN WOOD**, Managing Director.

"West India and Panama Telegraph Company—**O. W. EARLE**, Chairman.

To the Right Hon., the Earl Granville, Secretary of State for Foreign Affairs."

The Index to Volume XIV. of the JOURNAL has not yet been printed.

MODERN ELECTRIC AND MAGNETIC DEVICES.

THE Polytechnic branch of the American Institute, Thomas D. Stetson, Esq., presiding, discussed the practical application of these half-known agents on Thursday evening, December 22d ult.

Prof. N. S. Keith gave some points of importance about electric conductors used for earth connections. They require not only to reach moisture in most situations several feet down in the earth, but also a large surface for contact therewith.

Earth is a bad conductor. Its magnitude makes it the best conductor known, but the conduction is retarded by the limited area in contact if the metal terminus in the earth is small. Lightning-rods should end not only at a point several feet below surface, but should have a plate of copper or the like several feet square at the bottom.

The best conductors to carry the currents to and from a set of electric lights are copper wires of large section. No. 3 wire is only about a sixteenth of a square inch in cross section. The copper conductors in the Edison system are often more than four times as large as that. They are not usually known by numbers.

A compound conductor much used in electric lighting is composed of two stout strips of copper, in sections like half-round files, inclosed in an iron tube, and separated from the tube and from each other by an insulating material analogous to bitumen. The insulation is very perfect. The positive current can be led through one copper, and the opposite current through the other.

At short intervals expansion boxes were provided in which the ends of two practically continuous rods were connected by flat curved springs of nearly the same material—a hard copper or brass—which would yield elastically to allow for expansion and contraction.

Mr. Hudson described the earth connections for telegraphic purposes. The small quantity of current allowed gas or water pipes to serve where such were available. In other situations, metal plates giving an extended area were required to give a free connection. He had, in an extensive practice, given a preference to such lying horizontal in preference to any other position. He believed that position favored the retention of moisture in the earth in contact with the plates. Water is a poor conductor, but a large mass of water conducts well by virtue of its great area.

Professor Keith said dry atmospheric air at ordinary pressure is one of the poorest conductors, or, in other words, the best insulator; homogeneous soft iron is a much better conductor than steel.

He believed it was practicable to defend oil tanks from lightning by providing an unusual number of points to receive the electricity by the silent quiet discharge. The superior conductivity of the column of vapor rising from an oil tank in warm weather increased the exposure of such structures to lightning, and requires that the provisions for its silent reception be much more than usually efficient.

Several explained the weak batteries variously named, working by the slow decomposition of the metal in the earth where two plates of properly different natures are buried in moist earth a little distance apart. Two plates each three feet square, set an inch apart, will give in moist earths a reliable current for ringing bells and working other small signal apparatus in a dwelling. The presence of ammonia from a cesspool or vault, from any source, greatly increased the action.

John W. Sutton opened the regular subject of the evening—Magnetic Clothing—and, in connection with other speakers, presented a review of the his-

ory of topical application of magnets to the human system, from *Zetas*, a Greek, of about the year 500, till the present day. There was strong proof that some systems were pained and others much more relieved by the presence of magnets—common steel magnets—on or near the skin. He had given the matter much attention, and illustrated his views of the action by producing the well-known curves by sifting iron filings on a surface of paper, or the like, laid over a magnet. He provided a series of short magnets, closely arranged between two sheets of vulcanized rubber, explaining his devices for placing and covering them, and vulcanizing the rubber; the rubber protected the magnets from oxydation by the perspiration; and with a muslin of proper thickness formed efficient belts, insoles, etc., while the thickness was not sufficient to prevent the magnetic condition being imparted to the hardened steel hermetically sealed up inside, which was done after the structure was completed, nor to prevent the magnetism being developed and felt outside, as was proved by the formation of the magnetic curves on the surface, or sifting on fine iron particles and slightly jarring the whole. He was manufacturing the articles for use as curative agents where the diseased condition was due either to nervous derangement or a malcondition of the blood, especially to an excess of uric acid in the blood and in the sweat. His magnets are each three-fourths inch long and one fourth inch wide.

He had been superintendent of a rubber manufactory. Using good gum, properly worked, he believed the articles would last indefinitely. There had not been sufficiently long use to test that quality.

ELECTRICITY IN THE MANUFACTURE OF PORCELAIN.

DYNAMO-ELECTRIC machines are used in France in porcelain manufacture. The paste used for porcelain often contains ferruginous particles, which give the baked articles a color or a minutely spotted appearance, where a pure white may have been desired. In this way, ceramic products may lose as much as fifty per cent. of their value. The attempts hitherto made to remove these traces of iron with magnets have met with poor success. Recently, however, at two important French works, the Faïencerie, of Orel, and the establishment of MM. Pill vuyt & Co., of Mehun-sur-Yèvre, it was decided to set up powerful apparatus in which the electricity, instead of being supplied from batteries, was obtained by means of a small Gramme machine driven by a steam-engine. The arrangement, which is said to work well, comprises a strong horizontal electromagnet, with the poles very near each other, and between them a thin box. The paste, very liquid, enters the upper part of this box, and is deflected toward the polar sides by a bent piece of zinc. As it flows down these sides, the iron corpuscles are caught on them by the magnetic force. The apparatus is cleaned twice a day by means of a jet of water, the magnet being demagnetized for the time. About one gram of iron particles is stopped in the passage of twelve kilos of paste, and from 500 to 600 kilos of paste may be passed through one apparatus in a day.

A LOCOMOTIVE provided with an electric head-light has been placed on the French Northern Railroad. The electricity is furnished by the application of the surplus power of the engine.

If you want to become a telegraph operator, send twenty-five cents to O. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

Journal of the Telegraph.

PUBLISHED SEMI-MONTHLY AT 195 BROADWAY.

THE JOURNAL is issued on the 1st and 16th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,730 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....\$ 2.00
One Copy, six months, postage included..... 1.00
Single Copies, 10 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$ 2.00
Half Inch " " "..... 1.00
Quarter Column, " " "..... 4.00
Half " " "..... 8.00
One " " "..... 16.00

Outs charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, FEBRUARY 1, 1882.

LAWS TO PROTECT SUBMARINE CABLES.

THE subject of protection to marine telegraph lines has at last reached the point when the matter must be considered by nations, separately, if not collectively, as was more than ten years ago proposed by the establishment of an international code of laws applicable to the parties thereto in peace as well as in war, and in effect making the subject a part of the law of nations. In the "Draft Outlines of an International Code," by David Dudley Field, published in New York, in 1872, this subject is fully considered and provided for. By that code the destroying or injuring an ocean telegraph is declared to be piracy, and that submarine telegraphs are within extra territorial jurisdiction of nations, and may be landed on the shores of any nation, and that all persons may correspond by international telegraphs, except that the government may suspend service if it is within its territory, under the obligation to notify such suspension to all other nations uniting in the international code. Submarine telegraph shall be exempt from acts of hostilities in time of war. The suspension of intercourse across belligerents' lines are also provided for.

The possibility of giving some legal protection to submarine cables was carefully considered by the Institut de Droit International. A committee was appointed in 1878 to consider the subject, and the presentation of its report to the meeting at Brussels in 1879 was followed by an interesting discussion (see the "Annuaire de l'Institut," 1879-80, pp. 351-394). The conclusions ultimately adopted by the Institut were as follows:

"1. It would be very useful if the various States would come to an understanding to declare that destruction of or injury to submarine cables in the high seas is an offence under the Law of Nations,

and to fix precisely the wrongful character of the acts and the appropriate penalties. With reference to the last-mentioned point, the degree of uniformity attainable must depend on the amount of difference between systems of criminal legislation. The right of arresting offenders, or those presumed to be such, might be given to the public vessels of all nations, under conditions regulated by treaties, but the right to try them should be reserved to the national courts of the vessel arrested.

"2. A submarine telegraphic cable uniting two neutral territories is inviolable. It is desirable that, when telegraphic communication must be interrupted in consequence of war, a belligerent should confine himself to such measures as are absolutely necessary to prevent the cable from being used, and that such measures should be discontinued, or that any damage caused by them should be repaired as soon as the cessation of hostilities may permit."

On another page we print a copy of a memorial which has been presented to Lord Granville on behalf of Ocean Telegraph Companies, setting forth the difficulties they have to contend with when repairing their cables, and asking for some protection in the matter. The subject has been brought prominently before the public lately by a long correspondence in the *London Times*.

What reason the telegraph companies had for only presenting the question for the consideration of the English government and not addressing and requesting in a similar manner the co-operation of all other maritime nations does not appear, but may be conjectured. It is a movement, however, that should be above national jealousy, when the entire civilized world is directly interested in its relations and disposition.

The *London Times* seems to comprehend the proper way of proceeding to effect the object sought for.

That journal makes some comments on the memorial which are worth producing. It says: "In review of the provocations given," by fishermen and others, "and the extensive damage suffered over and over again, the language of the memorial to Lord Granville is singularly calm and moderate. The companies ask, as they have a right to ask, for protection." As to how they are to be protected, the *Times* continues: "The possible remedies may be divided under two headings. There are those which our own government can enforce, and those which can only come from a general agreement, to which other governments must be parties. Of the first kind are the additions to our own statute law, which would make willful or grossly careless damage to submarine cables a penal offense. But far more important than anything which the English government can do would be the effect of an international arrangement for the legal protection of submarine cables. It is, therefore, much to be desired that the needful protective legislation should be taken up as a common work by all countries. Germany, as an extract from a communication from

the Minister of Posts and Telegraphs shows, is bestirring herself with a view to this. England, which has a larger stake than Germany, ought not to be less forward." The article concludes by referring to the question of the lights of telegraph ships and their having to pay harbor dues in Great Britain. The communication from the German Minister of Posts and Telegraphs referred to above, reads as follows: "I have already entered into communication with the proper functionaries of the German Empire with the view to bring about, for submarine cables, the legal protection urgently required in the direction of international provision and the alteration of our internal German penal code." France is also stirring in the matter. It is stated that M. Ochoy, the French Minister of Posts and Telegraphs, is preparing a project for the protection of cables which is to be laid before the French Chamber of Deputies at an early date.

The memorial was also presented to the Board of Trade in London, and in their reply, among other suggestions, they say, "There is one observation which applies to all these causes of complaint, and which, in itself, affords a reason why neither the Board of Trade nor any other department of Her Majesty's government, or even the British legislature, can, even if so disposed, afford immediate relief. This is, that in every one of the cases of complaint mentioned in the memorial, foreign nations are concerned as well as ourselves, and we can only proceed with their concurrence."

The extent and importance of submarine cables will more fully appear in the following list of lines, and their length in nautical miles up to January 1st, 1881, as follows:

| | Miles. |
|----------------------------------|--------|
| Anglo-American..... | 13,319 |
| Black Sea..... | 403 |
| Brazilian Submarine..... | 4,237 |
| Cuba Submarine..... | 1,068 |
| Direct Spanish..... | 931 |
| Direct United States..... | 8,436 |
| Eastern..... | 13,888 |
| Eastern and South Africa..... | 4,441 |
| Eastern Extension..... | 13,021 |
| German Union..... | 368 |
| Great Western..... | 5,590 |
| Mediterranean Extension..... | 326 |
| Mediterranean and Brazilian..... | 520 |
| Platino-Brazilian..... | 1,219 |
| Submarine..... | 703 |
| West Indian and Panama..... | 4,680 |
| Western and Brazilian..... | 2,901 |
| Total..... | 72,569 |

During the past year about ten thousand more miles were laid and contracted for, and will probably be completed this year. The Central and South American Telegraph Company commenced laying its cables, which, when completed as contracted for, will exceed 3,082 nautical miles, and the American Telegraph Cable Company has about six thousand miles of new line.

The time is now near at hand when nations must mutually consider and agree together for the uses and protection of submarine telegraphs by treaties or conventions similar in effect to those laws specified in Mr. Field's proposed International Code above mentioned. The sooner proper steps are

taken to bring this about the better. The propositions for such a convention would very appropriately come from the United States Government, through the Secretary of State.

CENTRAL AND SOUTH AMERICAN TELEGRAPH COMPANY.

THE report of this company states that the contracts have been concluded for 3,082 nautical miles of submarine cable of various types, with the India Rubber, Gutta Percha and Telegraph Works Company (Limited), of London. And the latter company is to lay and guarantee the perfect working of these cables as a whole, and is required to guarantee that the various types of cable shall be of sufficient length, respectively, to properly connect the points required. The cable connecting Panama with Callao is to be completed by May, 1882, and it is expected that the whole line will be in commercial operation during the ensuing month of July. Careful estimates of cost have been made, and it is expected the company will have an ample cash surplus and 1,000,000 dols., par value, of its stock in its treasury on closing the construction account. This result will be attained notwithstanding the fact that the company will have about 900 tons of cable more than the original estimates called for, and that it has secured the following valuable exclusive telegraphic rights not included in the original prospectus:—United States of Columbia, the exclusive right covering its Pacific coast, inclusive of the Isthmus of Panama, for twenty-five years; Ecuador, the exclusive right for fifty years, and Peru, the exclusive right for twenty-five years. All of these rights have been ratified and confirmed by the respective governments, and contain other privileges highly beneficial to the company. J. B. Stearns, who has been appointed electrician and general manager of the company, has secured an experienced staff of electricians to watch over the cable in every stage of its manufacture and laying.

The establishment of these cables will connect, telegraphically, the United States with Brazil, via Mexico, Guatemala, Costa Rica, Panama, Colombia, Ecuador, Peru, Bolivia, Chili, and the Argentine Republic; and their geographical position is such as will insure a large and remunerative traffic from the time of opening. An account of the laying of some of these cables can be found in our last number.

TELEGRAPHIC LITIGATION.

PITTSBURG, Pa., December 27, 1881.—The telegraph system of the Baltimore and Ohio Railway Company on its Pittsburg Division is operated under an exclusive contract between the Western Union Telegraph Company and the Pittsburg and Connellsville Railroad Company. The Western Union Telegraph Company obtained an injunction in November, 1880, restraining the Baltimore and Ohio and Pittsburg and Connellsville Railroad companies from operating these telegraph lines, as was proposed, for commercial business, except under its contract with the Western Union Telegraph Company, which injunction is still in force. The railroad company has recently proposed to establish a separate office here and operate these lines in connection with its general system, exclusive of the Western Union Telegraph Company. A motion for an attachment against the Baltimore and Ohio Railroad Company, Baltimore and Ohio Telegraph Company and others was heard this morning, and attachment was directed to issue. As the parties denied any intentional contempt, the Court ordered

them to be discharged upon payment of the costs of the proceeding, upon condition that they desist at once from the acts complained of. Counsel for defendants in open court undertook for them that they would cease doing any commercial business.

Correspondence.

THE NEW YORK ELECTRICAL SOCIETY.

To the Editor of the Journal of the Telegraph:

A SPECIAL meeting of the New York Electrical Society was held in Mott's Hall, No. 64 Madison Ave., on Wednesday evening, December 28, 1881. Mr. George Kift Winter, M. S. T. E. Electrical Engineer, formerly of Arcanam, Madras Presidency, by invitation, explained the operation of the "Muirhead Quadruplex," of which he is a joint inventor.

The system was invented in 1875, and tried, experimentally, first on a line 84 miles, and then on a line of 200 miles in length, with success.

Its special features are the double substitution duplex, two pole changers or reversing keys, and two polarized relays, one of which has two electro-magnets and two tongues or armatures which are differently polarized.

In the double substitution system the battery is connected to the earth from the middle, leaving one half in the main and one half in the artificial line.

If the resistances of the main and artificial lines are equal no current traverses the ground wire.

The receiving instruments are placed in the ground wire and are unaffected by the action of the home battery.

The transmissions are effected by reversing the polarity of the sections of the battery. One of these sections has, say a strength of 1, while the other has a strength of 2.

The values of the battery strengths sent to line will be:

| | |
|----------------------------|-----|
| Both keys open | + 3 |
| Key B closed, A open | + 1 |
| Both keys closed | — 1 |
| Key A closed, B open | — 3 |

The single polarized relay answers to the movements of key A; or, in other words, to currents of a negative polarity. The compound relay answers to the manipulations of key B, in a peculiar manner. Its armatures being oppositely polarized, are adjusted so that a current of + 3 or — 3 is required to move one or the other from its contact point. The local circuit is completed when both armatures are against their contact point. A current of + 1 or — 1 is not sufficiently strong to move the armatures from the contact points, and therefore a signal is recorded. Mr. Winter described at length the minor details of the system, and at the conclusion of his remarks was voted the thanks of the meeting.

President F. W. Jones gave a brief resume of the efforts of inventors in multiple telegraphy from 1855 to the present time, detailing the peculiar difficulties encountered by Prof. Edison in bringing the quadruplex to a practical focus in September, 1874; also the changes since made in the system by various electricians reducing it to differential form in August, 1875, between Chicago and Detroit; in which form it is now successfully operated by the Western Union Telegraph Company, on a great many wires.

Mr. E. A. Leslie, of the Western Union Telegraph Co., New York, illustrated the application of the dynamo machine currents to the quadruplex with a very clear description of Mr. S. D. Field's peculiar key system by which the currents are applied.

At the regular meeting of the society, held on Wednesday evening, January 4th, Mr. T. D. Lockwood read a very interesting paper on "The Electro-Magnetic and Magneto-Electric Manifestations of Electricity and Magnetism."

The lecturer reviewed the history of the sciences of electricity and magnetism from the earliest times to the present day, and gave a historical account of the progress of electro-magnetism and magneto electricity. Although the weather on both meeting nights was very unpleasant the attendance was quite large, and several new members were elected, making the total membership 340. Deep interest is manifested in the society's work.

Papers have been promised in numbers sufficient to fill all dates for three months, and promises are still coming in.

The executive committee have arranged to devote alternate meetings to subjects of an elementary character. The Hon. Geo. B. Walker, United States Commissioner to the Paris Electrical Congress, and an honorary member of the society, has notified the Secretary that a full report of the proceedings of the Congress has been mailed.

THE CHICAGO ELECTRICAL SOCIETY.

To the Editor of the Journal of the Telegraph.

THE fifty-fourth regular meeting of the Chicago Electrical Society was held Monday evening, Jan. 16th, at the Grand Pacific Hotel, in one of its commodious club-rooms. A number of the members were previously engaged at another gathering at the same hotel, which, on the principle that there is no great loss without some small gain, was fortunate, for they could not have found seats. The room was packed with the best of Chicago's scientific enthusiasts, who had assembled to listen to Prof. Thomas W. Tobin, now of the Louisville Polytechnic, and late of the Royal Polytechnic Institute of London. Prof. Tobin is one of that class of lecturers who is never nonplussed by a failure, for the reason that he has none. His subject, Harmony and Discord, was amply and perfectly illustrated. The coarser vibrations are visible to the eye. With a rope attached near the center of the room, he showed how a pendulum is the type of all vibration, of all excursionary movement, then, how doubling the vibratory rate increases the number of nodes, and this doubled again, again doubled the nodes. Passing from this to Tyndall's rider wire, he showed how mathematicians determined the nodal points and proved their position by bits of paper hung upon the wire. Then finer vibrations were illustrated, movements of such dimensions as to be invisible to the eye, yet appreciable to the ear. This was done by an extemporized twanging wire with a stop like a violin bridge, which could be moved at will. Twanging this wire and suddenly removing the stop, gave pleasant or unpleasant results, as the two sets of vibrations bore harmonious or unharmonious relations to each other. The ear has a delicate, harp-like arrangement in its protected depths, each string of which has its own fundamental rate of vibration, and when a proper chord reaches the ear, aural harmony results and the effect is pleasing; otherwise the result is an unpleasant one. The tones of an organ were brought into use to illustrate this effect.

Tyndall's sensitive flame showed the result of inharmonious sound waves impinging on the flame, which had been previously attuned to the proper rate by compressing the gas receptacle, the jingling of a bunch of keys, the ringing of a bell, as well as hissing vocal sounds, produced the most lively motions on the part of the flame.

The phonograph (a new and very perfect form)

gave results which were highly satisfactory, and showed how the vibrations might be made to leave a record visible to the eye, and afterward be audibly reproduced.

The Professor exhibited his glass baby, an apparatus fashioned to imitate the vocal organs, having a rubber larynx and a painted face over a glass head, which produced much merriment, as well as being very instructive. The articulation rivalled that of the phonograph.

At various points in the lecture the professor was interrupted by vociferous applause, and at the close a thoroughly heartfelt vote of thanks was unanimously tendered him, while many a watch was drawn forth, the time (considerably over an hour) having passed so quickly that all were astonished when the fact became apparent.

The next meeting will be held on the third Monday in February, when Dr. Roswell Park, one of the rising physicians of Chicago, will favor us with a paper on Electricity in Surgery.

FREAKS OF TELEGRAPH WIRES.

To the Editor of the Journal of the Telegraph:

Will you please give an explanation in your next issue of the following phenomenon?

We have running in our office here four wires, our switch-board having capacity for one more wire. The fifth wire does not connect, being a through wire to Texas. What I wish to know is this: When the four wires that are connected here are quiet there is an under-current passes through some one of the instruments, from which, if the room is very quiet, we can read as well as if the instrument was working.

W.

ANSWER.—Impossible to explain this without examination or more details than are above given. It is most probably due to inductive effects from the fifth wire, but may be caused by leakage between wires.

CABLE ALPHABET.

A CORRESPONDENT asks us what kind of alphabet is used on the submarine cables?—A. The alphabet used on all cables is what is known as the "Continental Alphabet" throughout Europe, where it is used. It is founded on the Morse, and the only letters that differ from the Morse are c, f, j, l, o, p, q, r, x, y, z,—the additional letters peculiar to foreign languages are æ (æ), œ (œ), ü (ue), eh è, ñ. The figures are all different except the figure 4. All these letters and figures are made by dots and lines the same as the Morse, and only differ in their relative position.

Registering instruments are used on cables because of the slowness of transmission of the signals.

In working long cables the signalling is effected by sending reversals of the current through them; one polarity of the current corresponding to the dot, the other to the dash.

MR. G. M. WHIPPLE, Superintendent of the Kew Observatory, England, is the authority for the statement that the amount of sky covered varies inversely as the barometric pressure, between the limits of 29 inches and 30.3 inches, the variation being most rapid between 29.8 inches and 30.1 inches. Above 30.3 inches the clouding increases with increasing pressure, attaining the mean at about 30.5 inches, and rising above it at 30.6 inches.

If you want to become a telegraph operator, send twenty-five cents to O. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

THE KATA KANA syllabary, made up of forty-eight characters, is the simplest form of Japanese written language, and is used in telegraphing. Messages can be sent in this character cheaper in Japan than they could be sent in New England in 1876.

Tariff Bureau.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY.
New York, February 1, 1882.

To all offices on Western Union lines:

The following changes which have been made since January 16, 1882 should be entered in the Tariff Book as they will not be republished.

CHANGES

Offices in Dakota which have no rate to squares 956, 957 and 958 will make their tariff to those squares 75 and 5. Offices in Illinois, Iowa, Manitoba, Minnesota, Missouri and Wisconsin which have no rate to squares 956, 957 and 958 will make their tariff to those squares 100 and 7.

ALABAMA.

267 Mott's Mill closed.

CALIFORNIA.

827 Albion changed to 827 Whitesboro.

* Allen Springs now * * Allen Springs 50 0 Bartlett Sp'gs

79 Antelope, reopened.

791 Aptos, now * * Aptos 100 0 Soquel.

* Congress Springs, now * * Congress Springs, 275 0 Santa Clara.

806 Etna, reopened.

* Glenbrook, Lake Co., closed.

* Great Western Mine, closed.

* Grimes Landing, closed.

726 Las Flores, closed.

* Middletown, Lake Co., closed.

* Millville, closed.

800 Milpitas closed.

790 New Hope, closed.

800 Pacheco, reopened as * Pacheco, 15 2 by telephone Martinez.

742 Poso, closed.

800 San Miguel, San Francisco Co., changed to 800 Ocean View.

743 Santa Paula, closed.

* * Saratoga now 250 0 Santa Clara.

800 Localoma, closed.

799 West Butte, closed.

799 Williams should read 799 Williams Station.

DAKOTA.

890 Armenia should read 890 America.

FLORIDA.

* * Enterprise now 75 0 Sanford

GEORGIA.

216 Belton, reopened.

186 Lawtonville, closed.

* Tennille now 25 2 by telegraph, Sandersville.

IDAHO.

* Paris now 75 5 Ogden Utah. Erase "100 40 Salt Lake City, Utah."

970 Westwood changed to 970 Bathdrum

ILLINOIS.

369 Jerseyville is now in square 348.

369 Kane is now in square 358.

339 Maysville should read 358 Maysville Pike Co.

* * Melrose now 25 0 Maywood Erase "75 0 Oak Park."

INDIANA.

* * St. Mary's Academy, given under So. Bend in Tariff Book, now free by telephone, South Bend.

LOUISIANA.

434 Estherwood, closed.

MINNESOTA.

Offices in Minnesota are hereby notified that their tariff to St. Paul and Minneapolis should not be more than 40 and 3. Minnesota offices which are now using a rate higher than 40 and 3 to St. Paul and Minneapolis will adopt that rate at once.

865 Maple Plain, closed.

854 Rolette, closed.

NEVADA.

* Belleville is now W. U. office, square 677.

* Bullionville now 100 7 Salt Lake City, U.

956 Glendive, closed.

* Glenbrook, closed.

728 Unionville, closed.

747 Washoe, closed.

NEW JERSEY.

41 Passaic Bridge. Ok. Passaic.

NEW MEXICO.

637 Cranes changed to 637 Coolidge.

NEW YORK.

* Glasco, now * * Glasco, 1 0 0 Saugerties.

74 Mapleton is in Cayuga Co.

* Naples is now a W. Union office, square 101.

OHIO.

169 Ashtabula Harbor. Erase "P. O. care Ashtabula."

* * Baltimore now W. Union office, square 202.

* * Hiram and * * Hiram College 10 0 by Stage, or 100 0.

special delivery, Garrettsville.

151 La Grange, Jefferson Co., changed to 151 Brilliant.

180 Pike Station, Wayne Co., changed to 180 Creston.

* * Suffield now * Suffield 15 1 Minerva.

213 Wellston reopened as * Wellston 25 2 Chillicothe.

OREGON.

783 Cascade Locks, or Locks, closed.

812 Drury, closed.

767 Grants should read 767 Grants Pass.

785 Locks, or Cascade Locks, closed.

* Monmouth closed.

* Pendleton is now a (N.M.) office.

* Prospect Farm is now a (N.M.) office.

738 Touchet should read 738 Touchet. P. O. care Walla

Walla, Washington Territory.

PENNSYLVANIA.

111 Daguaschonda, closed.

91 Fayetteville, closed.

84 Halls P. O. is Hartley Hall. Erase "P. O. care Embree

ville."

* * Irvington, Chester Co., etc., should read * * Irvington.

Delaware Co., 50 0 Chester

51 Oakland, Monroe Co., changed to 51 Cresco, Monroe Co.

59 Penn. Military Academy, closed.

84 Riverside. Erase "Ck Danville."

* * Shoenauerville is in Delaware Co.

59 Waynesburg, Chester Co., changed to 59 Honey Brook.

SOUTH CAROLINA.

146 Adams Run, closed.

TENNESSEE.

255 Emery Gap, closed.

UTAH.

* Alta City, closed.

576 Stockton, closed.

VERMONT.

30 Sheldon, Ck. St. Johnsbury.

VIRGINIA.

* Disputants, Wakefield and Waverly are now W. Union offices in square 78.

* Ivor and Windsor are now W. Union offices in square

69.

WASHINGTON TERRITORY.

* Ft. Colville, closed.

WEST VIRGINIA.

* Lewisburg and * Red Sulphur Springs, now 40 3 Green brier W. S. Springs, or 65 4 Huntington.

WISCONSIN.

Offices in Wisconsin are hereby notified that their tariff to Madison should not be more than 40 and 3. Wisconsin offices which are now using a rate higher than 40 and 3 to Madison will adopt that rate at once.

325 Lake Mills now * Lake Mills 20 1 by telephone, Water town.

ATLANTIC CABLE.

The cable between Wladivostok and Nagasaki is repaired. Collect rate "Via Siberia" on Japan business.

CUBA CABLE.

The attention of managers is called to the rule which requires numbers in all messages, except cipher, must be written out in words. Figures are prohibited in plain and code messages, unless they are used to duplicate numbers previously written out, in which case they are counted for as many words as are used to express them.

The cable between Colon and Jamaica is repaired; and the rates in force previous to the interruption restored.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in double columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

255 Bangor. 321 Priehards.
284 Calera. 266 Stock Mill P. O. Pleasant Gap.
323 p. 2.
291 Fannville.
• Ft Morgan, 75 5 Mobile.
• Gainesville, 25 2 Epsa.
• Point Clear, 50 3 Mobile.

ARIZONA.

631 Bwle Station. 659 Holbrook.
640 Canon Diablo. P. O. 659 Winslow P. O. Brigham City.

ARKANSAS.

449 Brentwood. 419 West Fork.
391 Jacksonport.

CALIFORNIA.

827 Albion Mills. 720 San Geronimo P. O. care
401 Deco 6. Banning.
799 Norman Station. 826 Table Bluff.
800 Ocean View. 827 Whiteboro.
• Tidwell's Bridge, 25 2 by telephone, Greenville.
• Lajayette, 15 2 by telephone, Martinez.
• Walnut Creek, 15 2 by telephone, Martinez.

COLORADO.

546 Agate. 590 Holleys.
565 Boreas. 599 Hortense.
623 Browns Canon. 625 Hot Springs.
540 Buffalo, Weld Co. 634 Ignacio.
623 Calumet. 540 Liff, P. O. care Big Spring.
564 Carr. Neb.
545 Duval, P. O. Morgan. 557 Red O'Neil.
541 First View. 634 Redwood.
546 Godfrey, P. O. care Deer 628 Sargents.
Trail. 558 South Pueblo, Ch. Pueblo.
545 Hardin, P. O. care Evans.

CONNECTICUT.

25 Hop River.
• Bridgewater, 20 0 by telephone, New Milford.
• Naubuc, 30 3 Hartford.
• Noroton, 10 0 by telephone, Stamford.
• Warren, 20 0 by telephone, New Milford.
• Wainpauk, 10 0 by telephone, Norwalk.

DAKOTA.

886 Big Stone City. 947 Houston.
916 Chamberlain. 896 Mayville.
947 Dickinson. 896 Montrose.
938 Eagle Nest. P. O. care 920 Northville.
Mandan. 916 O'way.
913 E. dition. 903 Preston.
890 Hillsboro. 940 Riding No. 8.
926 Hitchcock.

• Crook City, 50 2 by telephone, Deadwood.
• Pine Ridge Agency, 150 9 Cheyenne Wy.
• Rosebud Agency, 175 10 Cheyenne Wy.
• Spear Fish, 50 2 by telephone, Deadwood.
• Sturgis City, 50 2 by telephone, Deadwood.

FLORIDA.

• Bino Pond, 75 5, (50 3 N. M. rate) Lake City.
• Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
• Highland, 50 4 Lake City.
• Paula, (N. M.) 100 5 Lake City.
• Perry Junction, 75 5, (50 3 N. M. rate) Lake City.
• Tocul, (N. M.) 50 3 Lake City.
• Waits Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

207 Dubois. 187 Folkston.
246 East Point. 186 Perkins Juno.
• Abbeville (N. M.) 40 3 Ft. Gaines.
• Arlington, 40 3 Ft. Gaines.
• Blakely, 40 3 Ft. Gaines.
• Senois, (N. M.), 25 2 Newnan.

IDAHO.

578 Arimo. 970 Dry Lake. P. O. care
970 Coccolala Lake. P. O. care Rathbun.
Vancouver. 970 Rathbun.

ILLINOIS.

300 Allendale. 318 Gaya. P. O. Whiteleys
317 A pine. Point.
325 Beecher City, Effingham. 316 Lanark Juno.
Co. 307 Mannheim.
329 Belknap. 347 Oakford.
337 Breckenridge. 337 Rockville.
307 Dummer. 313 Stockton. P. O. Loza.
346 Forreston Juno.

INDIANA.

300 Cynthiana. 262 Milroy.
230 English Lake. 300 Owensville.
263 Letts corner. 290 Paxton.
298 Lowell. 253 Westport.
• Ferdinand. By mail, Ferdinand Station.
• Illiana, free, by telephone, Dana.
• St. Meinrad. By mail, Ferdinand Station.

IOWA.

426 Angus. 435 Lake City.
367 Buffalo. 407 Laurel.
425 Dakota City. 397 Libertyville.
367 Fairport. 435 L. nrvile.
416 Galt. 337 Montpelier.
407 Girard. 455 North Boro.
425 Hardy. 416 Pilot Mound.
416 Harcourt. 417 Polo.
425 Irvington. 425 Rutland.
416 Kamrar. 473 r. a. ix.
434 Irwin. 477 Van Cleave.
445 Kirkman. 417 Van Wert.
344 La Crosse, Ok. Hamill. 425 West Bend.
425 Willow Glen.

KANSAS.

517 Alum Creek. 506 Hazelton.
484 Argentinus. 503 Horton, P. O. care Em-
484 Barclay. p. r. ia.
527 Cleveland. 527 Lenora.
517 Clifton. 418 Mu berry Grove.
577 Oliver. 476 Wakarusa.
527 Edmond. 466 Westphalia.
54 Garva.
• Cottonwood Falls, 50 0 Cottonwood.
• Enterprise, 15 0, by telephone, Detroit.

KENTUCKY.

263 Bloomfield. 263 Finchville.
263 Crescent Hill. 263 Taylorsville.
• Clay Lick, 25 1 by telephone, Worthville.
• Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Hunting-
ton, W. Va.
• Eastern Juno., 50 3 Lexington, Ky., or 35 2 Hunting-
ton, W. Va.
• Flemingsburg, 15 2 by telephone, Johnson Juno.
• Gistville, 25 1 by telephone, Worthville.
• Gratz, 25 1 by telephone, Worthville.
• Lockport, 25 1 by telephone, Worthville.
• Marion, 15 1 by telephone, Worthville.
• Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington,
W. Va.
• Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W.
Va.
• Port Lillo, 25 1 by telephone, Worthville.
• Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
• Springfield, 20 1 by telephone, Worthville.

LOUISIANA.

424 Eola. 442 Pleasant Hill.
424 Garland. P. O. care 433 Provençal.
Washington. 433 Hobelins, P. O. care Mans
field.
442 Grand Cane. 442 San Patrice.
354 Lookout. 442 Stonewall.
434 Mernoncau. 424 Whitesville.
383 Mounds Sta.
• Milikens Bend (N. M.), 40 3 Tallulah.
• Plaquemine, 10 3 New Orleans.
• St. James, 50 3 New Orleans.
• Vacherie, 50 3 New Orleans.

MAINE.

4 Presque Isle.

MARYLAND.

77 Bowie. 85 Odenton.
67 Edgewood. 84 Peninsular Juno.
65 Lutherville. 64 Pocomoke Station.
77 Mariboro.

MASSACHUSETTS.

36 Conway. 21 Wellesley Hills.
• Bus River Harbor, 05 0 by telephone, So. Dennis.
• Cochesett, 15 0 by telephone, East Bridgewater.
• Collins' Mills, Dracut, 15 1 by telephone, Lowell.
• Dracut Navy Yard, 15 1 by telephone, Lowell.
• Forae Village, 15 1 by telephone, Lowell.
• G. anitorio, 15 1 by telephone, Lowell.
• Hyannisport, 15 0 by telephone, Hyannis.
• Lunenburg, 10 0 by telephone, Fitchburg.
• Matfield, 50 0 East Bridgewater.
• Me rose Highlands, 15 0 Melrose.
• Middlesex Village, 15 1 by telephone, Lowell.
• Puenix Village, Tewksbury, 15 1 by telephone, Lowell.
• South Blueica, 15 1 by telephone, Lowell.
• South Mills, 10 0 by telephone, New Bedford.
• Westham, 35 0 by telephone, Providence, R. I.
• West Bridgewater, 15 0 by telephone, East Bridgewater.
• W. Chelmsford, 15 1 by telephone, Lowell.
• Westford, 25 0, West rd Depot.
• Westford Depot, 15 1 by telephone, Lowell.

MEXICO.

• Paso del Norte, 05 0 El Paso, Tex.

MICHIGAN.

220 Beech. 231 Jerome.
231 Bridge water. 119 Manistee Juno. P.
210 Brockway Centre. O. care Tallman.
210 Fostoria. P. O. Water-
town. 210 Marlette.
119 Free Soil. 127 Mayvil e, P. O. May.
127 Indian River. 127 Vanderblit.

MINNESOTA.

190 Argyle. 857 Mission Creek.
845 Arlington. 890 Muskoda.
875 Buffalo Lake. P. O. care 869 Oshawa.
Stewart. 869 Rock Island Quarry. P.
865 Hamburg. P. O. care O. care Sauk Rapids.
Norwood. 874 Vernon Centre.
889 Kennedy. 865 Waconia.
861 Minnehaha. 863 Winthrop.
• Currie, 25 2 Tracy.

MISSISSIPPI.

351 Courtland. 363 Morton.
• Arcola, 80 6 Vicksburg.
• Johnsonville, 80 6 Vicksburg.
• Stoneville, 80 6 Vicksburg.

MISSOURI.

457 Ellis. 428 Montserrat.
369 Eilah. 398 Shalbyville, Ch. Shalbina.
• Augusta, By mail, Labadie.
• Purdin, 25 2 Unionville.

MONTANA.

957 Iron Butte. P. O. care dan, Dak.
Glendive. 583 Silver Bow Juno. P. O.
956 Keith. P. O. care Man- care Butte City.

NEBRASKA.

927 Atkinson. 922 Long Pine.
• Benk'emn, (N. M.) 60 4 Plattsmouth.
• Burchard (N. M.) 35 2 Plattsmouth.
• Liberty, (N. M.), 35 2 Plattsmouth.

NEW BRUNSWICK.

3 Albert. 3 Lake Ha Ha.
3 Carleton Sta. 3 St. Louis.
• Port Elgin, 25 2, Backville.

NEVADA.

676 Luning. 676 Soda Springs. P. O. care
Belleville.

NEW HAMPSHIRE.

20 Livermore.
• Chesterfield, 25 0 by telephone, Brattleboro, Vt.
• Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
• North Hinesdale, 20 0 by telephone, Brattleboro, Vt.

NEW JERSEY.

41 Brick Church. Tariff 47 Clementon.
same as Orange. 47 Maguola.
53 Cedar Brook. 52 Valley.
41 Centerville, Passaic Co.

NEW MEXICO.

637 Coolidge. 631 Monero.
637 Gallup. P. O. care Win- 630 San Antonio.
gate.
• Fort Stanton, 25 2 San Marcial.

NEW YORK.

64 Albion Station Oswego 51 Rockland.
Co. Ch. Sand Bank. 74 Soliba.
65 Apalachin. 44 Trembloy Iron Works.
40 Cornwall on Hudson. P. O. care Clayburg.
51 Fish's Eddy, Delaware Co. 65 Vestal.
64 Maunsville. 48 Wicopee Juno. P. O.
63 Nichols. care Matteawan.
83 North Lansing.
• Minisink, Orange Co., 15 1 Port Jervis.

NORTH CAROLINA.

205 French Broad. 173 Newton.
• Falkland, (N. M.), 25 2 Tarboro.
• Pactilus, (N. M.), 40 3 Tarboro.

NOVA SCOTIA.

2 Abion Mines. 2 Sherbrooke.
• Baddeck, 25 1 North Sydney.
• Ingonish, 25 1 North Sydney.

OHIO.

221 Alvada. 221 McClure.
131 Brilliant. 180 New Berlin, Stark Co.
180 Creston. 242 Osgood Sta.
180 Everett, Summit Co. 159 Strasburg, Stark Co. P.
204 Hadley Junction. P. O. O. Maximo.
Thurston. 213 Wheelersburg.
221 Lucky.
• De Kalb, 25 2 Mansfield.
• Hartsville, 15 1, Minerva.
• Hayville, Ashland Co., 15 1 by telephone, Ashland.
• Middle branch, 15 1, Minerva.
• Mogadore, 15 1, Minerva.
• Monroe Centre, 20 1, Kingsville.
• New Hazelton, 15 1, Minerva.
• Osnaburg, 15 1, Minerva.
• Pierpont, 25 2 No. Kingsville.
• Poland fr e by telephone, Youngstown.
• Robertsville, 15 1, Minerva.
• Sherodsville, 15 1, Minerva.

OREGON.

793 Pravertown. 785 Cascade Incline. P. O.
795 Whites. Cascades, Wash'n Ter.
• Airie (N. M.), 50 2 Portland.
• Bline Mountain, 10 5 by telephone, Walla Walla, W. T.
• Fort Klamath, 50 3, Ashland.
• Linkville, 50 3, Ashland.
• Milton, 50 5 by telephone, Walla Walla, W. T.
• Weston, 50 5 by telephone, Walla Walla, W. T.

PENNSYLVANIA.

140 Corlies. 140 S. and A. Junction. P.
52 Cresco, Monroe Co. O. care Mercar.
122 Elk Lick. 121 Stonersville.

151 Etna, Allegheny Co. 130 Thompsons, Warren Co.
 140 Evansburg, Butler Co. P. O. care Irvine.
 P. O. Breakneck. 59 Virginville, Ch. Moore-
 151 Fallston. lem.
 59 Honey Brook. 140 Volant.
 131 June-Bug. 151 Wilkinsburg.
 140 Lucinda Station. P. O. 151 Willow Grove, Allegheny
 Lucinda Furnace. Co.
 140 Nesbannock Falls. 140 Wilmington. P. O. New
 58 Rowland's. Wilmington.
 111 Songbird. P. O. care 140 Zellenopolis.
 Oyster City.

• Academy Corners, 15 1 by telephone, Lawrenceville
 • Alms House, 10 1 Allentown.
 • Balliettsville, 10 1 Allentown.
 • Best Sta., 10 1 Allentown.
 • Centre Point, 10 1 Allentown.
 • Churchville Berks Co., 10 1 Allentown.
 • Clayton, 10 1 Allentown.
 • Corning, 10 1 Allentown.
 • Cowanesque Valley, 20 1 by telephone, Lawrenceville.
 • Dillinger'sville, 10 1 Allentown.
 • Elmer, 20 1 by telephone, Lawrenceville.
 • Eagleville, 10 1 Allentown.
 • Fairview, Montgomery Co., 10 1 Allentown.
 • Fagleyville, 10 1 Allentown.
 • Franklin, Lehigh Co., 10 1 Allentown.
 • Gilbertsville, 10 1 Allentown.
 • Harrison Valley, 20 1 by telephone Lawrenceville.
 • Harrison Valley Tannery, 20 1 by telephone, Lawrence-
 ville.
 • Ironton, 10 1 Allentown.
 • Limerick Square, 10 1 Allentown.
 • Lower Milford, 10 1 Allentown.
 • Neffa, 10 1 Allentown.
 • Nelson, 10 1 by telephone, Lawrenceville.
 • New Berlin, 10 1 Allentown.
 • Pleasant Corner, 10 1 Allentown.
 • Red Hill, 10 1 Allentown.
 • Ruchsville, 10 1 Allentown.
 • Saegersville, 10 1 Allentown.
 • Sonnencksville, 10 1 Allentown.
 • Slatedale, 10 1 Allentown.
 • Trappe, 10 1 Allentown.
 • Yellow House, 10 1 Allentown.
 • Zionsville Sta., 10 1 Allentown.

QUEBEC.

Beauce Junc. Hulets Landing.
 Bulwer. St. Alphonse de la Grand
 Estia. Bois.

SOUTH CAROLINA.

146 Jacksonboro.

TENNESSEE.

292 Bellevue. 340 Withe.
 292 White Bluffs.

TEXAS.

Until further notice, the P. O. address of Antelope Boracho, Cariso Pass, San Martin and Wildhorse will be care Supt. Telegraph, Marshall, Texas.

656 Antelope (South). 470 Lodi. P. O. care Kildare.
 479 Bagwells. P. O. care 555 mets (South). P. O. care
 Clarksville. Big Springs.
 657 Boracho (South). 489 Margaret.
 652 Bremen (South). P. O. 656 San Martin (South).
 care Baird. 657 Sierra Blanca (South). P.
 657 Cariso Pass (South). O. care Toyah.
 485 Clear Creek. 648 Trinity Mills
 495 Cuero (South). 470 Wayne.
 460 Forest. P. O. care Queen 500 West.
 City. 657 Wildhorse (South).
 654 Iatan (South). 459 Wharton.

• Benavides, 25 2 Corpus Christi.
 • Kountz, 35 2 Beaumont.
 • Salado, 40 3 Round Rock.
 • San Diego, 25 2 Corpus Christi.
 • Village, 40 2 Beaumont.

VERMONT.

27 Miles Pond. Ch. St. 31 Pompanoosuc.
 Johnsonbury. 39 South Wallingford.
 27 Passumpsic.

• E. Rupert, 15 2 Factory Point.
 • Guilford, 10 0 by telephone, Brattleboro.
 • Hartwellville, 20 1 by telephone, No. Adams, Mass.
 • Jacksonville, 25 2 by telephone, No. Adams, Mass.
 • North Stamford, 15 1 by telephone, No. Adams, Mass.
 • Readsboro, 20 1 by telephone, No. Adams, Mass.
 • Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
 • Sadauga, 25 2 by telephone, No. Adams, Mass.
 • Stamford, 15 1 by telephone, No. Adams, Mass.
 • Wells, 15 2 Factory Point.
 • West Dover, 25 0 by telephone, Brattleboro.
 • Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

162 New River Depot. 153 Roanoke.
 • Lairds, (N. M.), 40 3 Richmond.
 • New Market, Nelson Co., (N. M.) 25 2 Richmond.
 • Salisbury, (N. M.), 40 3 Richmond.

WASHINGTON TERRITORY.

774 Carbonado. 722 So. Texas.
 774 Skagit City. 784 White River.

WISCONSIN.

845 Barneveld. 306 Spring Meadow. P. O.
 852 Haywood. care Wauwatosa.
 839 Kerpeter. 325 Sullivan.
 825 Jefferson Junc. 852 Superior Junc.
 856 Livingston. 839 Summit Lake.
 847 Rudolph. 855 Turtle Lake.

NORVIN GREEN,

President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
 WESTERN UNION TELEGRAPH COMPANY,
 New York, Jan. 31, 1882.

To all Transfer Agents and offices.

The transfer service has been resumed at Annapolis, Md.

NORVIN GREEN,

President.

GENERAL MANAGER'S OFFICE,
 WESTERN UNION TELEGRAPH COMPANY,
 New York, January 28, 1882.

To all Superintendents, Managers and C. N. D. Agents:

On and after February 1, 1882, special orders for Commercial News quotations or questions concerning prices quoted by the Commercial News Department, must be charged for at regular W. U. rates for the messages of inquiry and of reply, and three cents per word for reporting. These messages do not come under the "C. N. D." rules for counting, but must be treated the same as ordinary W. U. messages.

Special entry should be made on Gold and Stock Department form 112, covering the reporting service, stating number of words, and amount collected therefor, at the word rate named above.

THOS. T. ECKERT.

General Manager.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT No. 149.—January 31, 1882.

CHARLES LE BARON, JR.

CHARLES LE BARON, JR., was murdered at Laredo, Texas December 7th, 1881. His certificate No. 1444, was issued February 29th, 1872.

One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4057.

Insurance expires March 2, 1882; Membership, April 1, 1882.

The number of members of the Association in good standing is: 1st Division, 2171; 2nd division, 132.

Remittances will be acknowledged by Agents of the Association when postage or postal card is enclosed; and an Agent's receipt is a sufficient voucher for all dues from Members. Remit by draft, express, P. O. order, or registered letter. Money forwarded by mail or messenger will be at the risk of sender. A number of assessments may be paid in advance, to avoid such remittances.

BY-LAWS—SECTION VIII. "Upon the death of a member of the Association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and in case payment shall not be made within 30 days thereafter, the delinquent shall forfeit all claim to the benefits of the Association; and should payment not be made within 60 days, shall forfeit membership, to which said delinquent can only be restored as provided in Section VII. of these By-Laws."

N. B.—AGENTS, especially those recently appointed, are—in accordance with Section III. By-Laws—respectfully reminded that, on the expiration of thirty days from the date of an assessment, all money on hand should be remitted to the Secretary; and they will facilitate the business, and insure accuracy of the records of collections of assessments, by making their return on the first of each month for the current assessment, including all collections on previous ones not yet remitted; and on, say the 10th of the month, a supplementary remittance covering any payments subsequently received by them. By the adoption of this plan but few, if any, numbers of certificates on which assessments may have been paid will appear in the list of delinquents printed in the JOURNAL OF THE TELEGRAPH.

A. R. BREWER,

Secretary,

P. O. Box 3175.

New York

TRANSMISSION OF SEPARATE SOUNDS ON ONE WIRE.

M. MAICHE has found by experiment that sounds of different characters produced from two separate sources can be sent simultaneously on one wire and received separately. He used at the receiving station two telephones of different resistances, and at the transmitting station caused a musical box to be set going on a microphone of small resistance, while an induction telephone transmitter was

spoken into at the same time. The musical sounds were reproduced in the telephone which had the least resistance and the vocal sounds in the other, so that with the two telephones to the ears the music could be heard by one ear and the speech by the other.

THE UNIVERSAL POSTAL UNION.

On January 2d the Sandwich Islands entered the Universal Postal Union, and after that date all correspondence addressed there will be subject to the rates provided for in the Universal Postal Union Convention, viz.:—On letters five cents per half ounce and on newspapers, printed matter, and samples of merchandise, one cent per two ounces. Newspapers and periodicals to regular subscribers cannot, after the above date, be mailed for the Sandwich Islands at "poundrates," but must be prepaid by stamps as above. The following countries have not yet joined the Universal Postal Union, viz.:—Australia, Bolivia, Ascension, Cape of Good Hope, Costa Rica, Fiji Islands, Greytown, Natal, New Zealand, Nicaragua, Patagonia, St. Bartholomew, and Siam, parts of Tangiers, Tripolis, Tunis, Morocco, West Indies, and China.

ELECTRIC FUSION OF METALS.

M. SIEMENS, in the presence of the members of the Congress of Electricians, performed the following curious experiment: in a crucible conveniently arranged furnished with a perforated cover, fragments of steel were placed; the two currents of an electro-motor apparatus entered the lower and the upper part of the crucible. In 14 minutes the metallic mass became hot, reddened and melted. The mass showed no inflation. The expense of the combustible consumed by the electric apparatus is much less than that which fusion by direct application of heat would necessitate.

THE LARGEST CLOCK IN THE WORLD.

The great Parliament House clock in London, Eng., usually called the Westminster clock, the largest clock in the world, says Mr. W. A. Hendrie, in the *Watchmaker and Metalworker*, was contracted for in the year of our Lord 1847, and started running in 1859, and started striking in July of the same year, although the construction was nearly completed in 1854 by the first Mr. Dent, a big name among watch and clock makers at the present day. The architect was Sir Edmund Beckett Dennison, who, as a designer in horology, has ably proved himself on the top of the perch.

The clock in its general design is of that kind known as the platform kind, and its plates measure 16 feet over all; the ends are built into the wall, while the bracing resembles the trussing of our bridge. There are three trains of wheels: the time train in the center, hour strike train on the left, and the quarter train on the right. The main wheels are 40 inches in diameter, while the cam lifters for hammer tails 38 inches diameter. There is only one cam lifter on main hour wheel, with 10 cams 3½-inch faces of steel. In this connection the above strength is necessary on account of the weight of the hammer to be raised (420 lbs.) to strike the great 15-ton bell. The quarter chime hammers are much lighter, being in proportion to the bells to be struck by them. There are four, and they weigh from 3 tons 18 cwt. down to 1 ton 1 cwt. The diameter of hoop wheel is 30 inches, and the flies are in the usual proportion, but as the flies are driven with one pair of miter wheels to throw them on end and reduce friction. The flies proper resemble a large-sized barn door, and the way they make the wind

blow is awful. I will describe the time train.

The main wheel is 28 inches diameter, while the barrel is 16 inches, with a capacity for 200 feet of line. Great wheel has 180 teeth; center, 120; third, 120, with pinions of 12, 16, and 9. This brings me down to the escapement, which is the far-famed one—the gravity. This one is called the three-legged, and is formed of two wheels with three teeth each on same arbor, with space between, and in this space comes the lifting pallets, which are driven by the weight, and as soon as the pendulum swings against the partly lifted pallet it is released, thus allowing the pallet or arm to propel the pendulum on its opposite passage, where the same action takes place and a corresponding impulse is given. This escapement takes away all imperfections of trains, as the weight or pallet arm alone gives impulse. This clock beats two second; length of pendulum, 13.064 feet from suspension to line of oscillation; weight of ball, 685 lbs.; length of suspension spring, 5 inches, 3 inches wide, and 1-60th of an inch thick; glass used in dials, 2½ tons, and, with iron, cost £5.334. Going part takes 20 minutes to wind; depth of well for weights, 174 feet; clock frame, 4 feet 7 inches wide; dials, 22½ feet diameter; weight of minute hand, 2 cwt., length, 14 feet. The pendulum rod is compensating, with an appliance for regulating. The cost of this clock, in addition to dials and hands, as above noted, was a little under £3,400, making the clock when finished cost the sum of £8,734.

The writer of this will never forget the beautiful sounds of the bells which the clock gives out when striking. The large bell is heard ten miles off, and the small ones four to five. This clock is reported giving an error of only 90 seconds per annum; but by making the appliance for regulating it faster or slower, as our city observatory does, debars us from forming an idea what it might be if left alone for one year.

AMERICAN CARS LIGHTED BY AMERICAN ELECTRIC LAMPS IN ENGLAND.

A REGULAR train of Pullman cars is now run upon the London, Brighton, and South Coast Railway, England. The train includes a parlor car, a drawing room car with ladies' boudoir and dressing-room, a restaurant car, and a smoking car, while a compartment at each end of the train next to the luggage compartment is provided for servants. The cars are kept at an equable temperature by means of hot-water pipes. There is electric communication between the parlor, drawing-room, and smoking cars and the restaurant car, and in many ways the comfort of passengers is provided for. The most important and novel feature of the train is, however, that it is lighted throughout by electricity.

The lamps used are Edison's incandescent lamps, 29 being used. On the very successful trial trip the electricity was supplied by Faure accumulators, of which 80 were carried. Mr. W. Lachlan, the engineer, representing the Société la Force et la Lumière, who was in charge of the batteries, reported that but 30 were brought into use on the down journey, and only a portion of the electricity stored in these was expended. On the up journey these and four fresh boxes were brought into operation. For the present the accumulators will be charged each evening at the society's depot at Charing Cross, but as soon as the necessary arrangements can be made it is intended that the recharging shall be done at Victoria with a dynamo machine worked by a small stationary engine. It is not improbable, however, that before long the electricity required may be generated on the train itself, the chief practical difficulty in the way of this saving of force arising, the Lon-

don Times says, from the unavoidable alterations in the speed of the train—a mechanical difficulty in the way of charging the accumulators in this way which the ingenuity of the electrical engineers will no doubt soon overcome.

PROTECTING IRON FROM CORROSION.

A RECENT invention by Mr. Lyte, of Putney, England, consists in an application of electricity for preventing the corrosion and consequent fouling of iron or steel ships, vessels, or structures, by attaching to them suitably arranged conductors in such a manner that the said ship, vessel, or structure when immersed in or wet by an electrolytic solution, sea-water, for example, shall become a cathode. The productive influence of studs or mosses of zinc, or other metal electro-positive to iron, attached to iron plates immersed in water or certain saline solutions has been already tried and proved, but for certain reasons this arrangement has been hitherto neglected as being difficult of application, costly, and imperfect in its action. Utilizing, however, the modern discoveries in dynamo electricity, Mr. Lyte proposes so to arrange one or more wires, or conductors, connected with the negative poles of one or more batteries or dynamo-electric machines, as to convey the currents to the parts to be protected, or distribute the effect as evenly as may be convenient over the whole or part of the ship, vessel, or structure to be protected, the anode being at the same time immersed in or connected with the electrolytic solution. By this means he sets up a de-oxidizing or reducing action all over the surface of the iron or steel to be protected, thus either arresting or materially diminishing the oxidation to which iron or steel are naturally prone, and he obtained thereby as a result the desired preservative effect.

CONVICTION FOR STEALING TELEGRAPH MESSAGES.

SOME time since W. T. King, N. J. Saires and others were detected in a conspiracy to steal telegrams from various telegraph companies in the city of Chicago, and through King to sell them to certain members of the Board of Trade. After considerable trouble these persons were indicted. On the trial after the prosecution had put in their evidence and rested the case the accused King and Saires pleaded guilty. Through the influence and persuasions of their friends and the fact that this was their first offense of the kind ever charged against them, the Court administered a severe rebuke and fined each of them two hundred dollars. It is to be remembered that in the State of Illinois there is no criminal law which meets cases of this kind. The indictment was for a conspiracy to defraud. This case will have a salutary effect in preventing similar attempts elsewhere.

ELECTRICITY PRODUCED BY LIGHT.

WHILE traveling in Mexico, M. Leur, mining engineer, was struck by the fact that the amalgamation of silver ore, by what is called the American method, only operates well under the influence of light. According to him, the action does not take place in the darkness. He sought the cause of this unexpected effect and his experiment seemed to him to show that light, by acting upon the mixture of sulphide of silver, sulphate of copper, salt and mercury, develops electricity without which the amalgamation cannot take place.

M. Boussingault, however, expressed an objection to this conclusion, which appears decisive; that in Mexico, the operation is not confined to small quan-

ties, but whole mountains of ore are acted upon. Now light is only able to act upon the periphery of the latter, and the largest part of their mass remains in permanent darkness.

SINCE November, 1878, the Lightning-rod Conference, formed by delegates from a number of learned bodies in Great Britain, has been at work, and has at length produced a report. In this report there is a description of the purposes a lightning-rod is intended to serve, with a statement of those features in the construction and erection of conductors respecting which there is great difference of opinion, and the final decisions on the points in question arrived at by the conference.

THE CHEAPEST PLACE TO BUY

PINS & BRACKETS,

In the world is from

L. B. HARRIS,

MANCHESTER, N. H.

Prices for 1,000 or less, F. O. B., as follows:

| | | |
|---------------------------------|---------|---------------|
| Plain Oak Brackets..... | \$15.00 | per thousand. |
| Painted " "..... | 17 00 | " " |
| Plain " Pins..... | 12.50 | " " |
| Painted " "..... | 13 00 | " " |
| Spools for Magnets, all sizes.. | 45.60 | " " |

Special prices for large quantities and samples furnished on application to

L. B. HARRIS,
Manchester, N. H.

ESTABLISHED 1830.

ALFRED F. MOORE,

(SUCCESSOR OF JOSEPH MOORE & SONS)

MANUFACTURER OF

INSULATED TELEGRAPH WIRES,

200 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

CONSUMERS AND OFFICE WIRE. FLEXIBLE CORDS. AMBULANCE AND BUREAU ALARM WIRE. ELEVATOR CABLES.

All wire used is thoroughly tested for conductivity, therefore ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP,

FOR FLEXIBLE CORDS.

Descriptive Circulars furnished upon application.

THE

BROOK'S PATENT INSULATORS

WHEN AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1877
At the Vienna Exposition, 1878
At the Cincinnati Industrial Exposition in 1874.
And at the Centennial Exposition at Philadelphia in 1876.

MANUFACTURED AND FOR SALE BY

DAVID BROOK,

23 North 21st Street, Philadelphia.

Operators' Cramps cured by



Digitized by Google

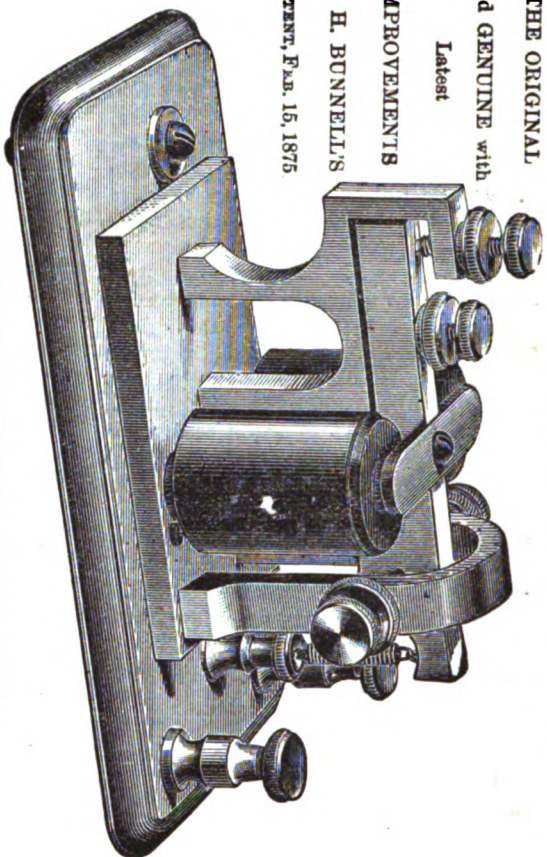
J. H. BUNNELL & CO.'S FIRST CLASS TELEGRAPH MACHINERY.

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS

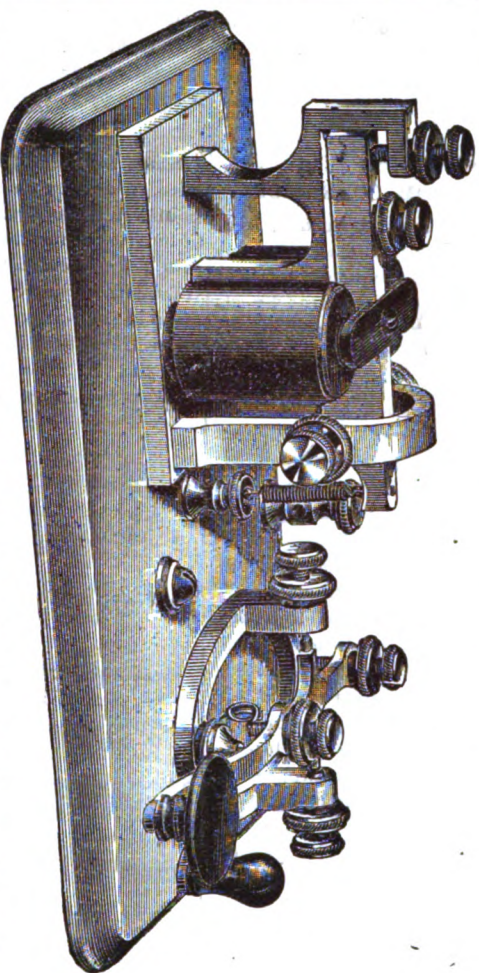
J. H. BUNNELL'S

PATENT, MAR. 15, 1875



THE GIANT SOUNDER—UNEQUALLED!

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$5.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



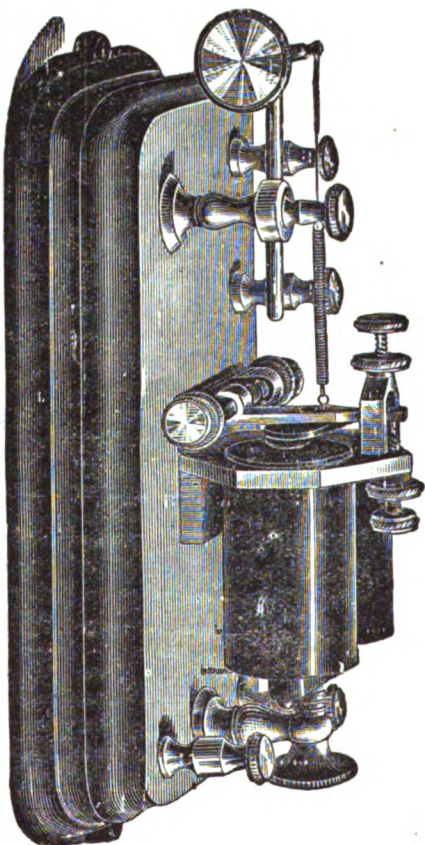
GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET:

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$8.00, carefully boxed and sent by mail, prepaid, to any part of the United States.

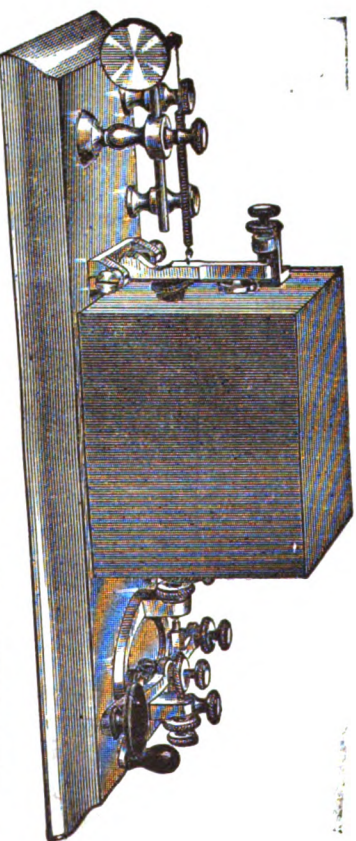
All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.



FIRST-CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

160 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Subbase, Extension Adjustment. Price, \$8.50.



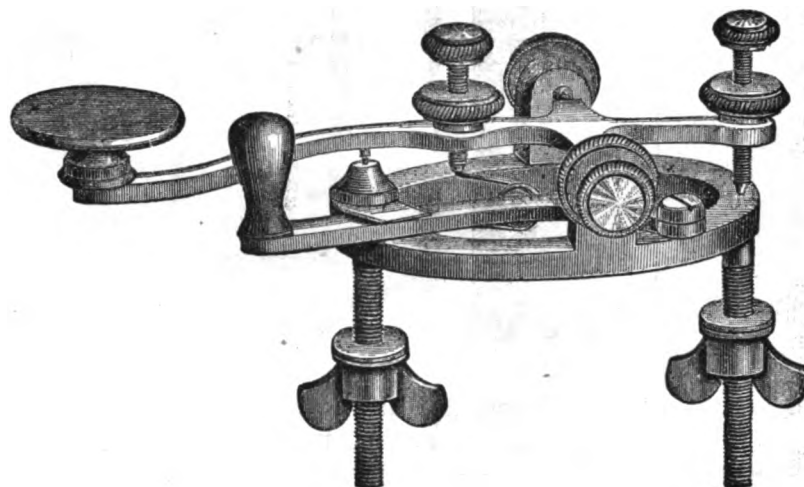
BOX SOUNDING RELAY AND STEEL LEVER KEY.

COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 160 ohms Silk Wire. Price, with Steel Lever Key on base, \$12.00; without Key, \$9.00.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.



BEST IN THE
WORLD.

PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:

The Lever is *only one-half* the weight of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

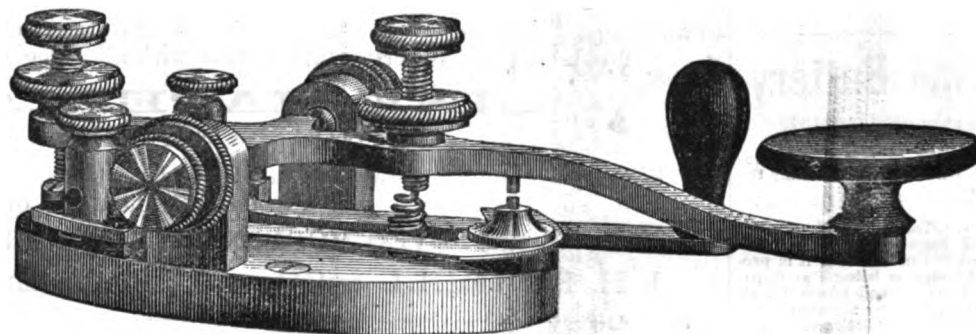
The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Legless Pattern Steel Lever Key.



A BEAUTIFUL AND PERFECT KEY,

Suitable for Use on Fine Desks, or Wherever a Legless Key is Preferable.

PRICE, Carefully boxed, and sent, prepaid, by mail to any part of the United States, **\$4.00.**

J. H. BUNNELL & CO., 112 LIBERTY STREET, NEW YORK.

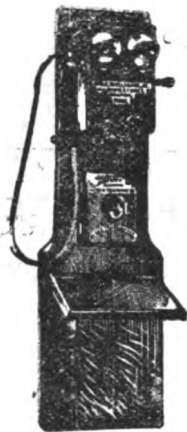
CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells,
District Bells and Switches for Exchanges, Annunciators, etc

TELEGRAPH & ELECTRICAL INSTRUMENTS,

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

GEO. WESTINGHOUSE, JR. Pres. RALPH BAGLEY, V. Pres. & Treas.

C. H. JACKSON, Gen'l Manager. ASAPH T. ROWAND, Secretary.

HENRY SNYDER, General Agent,

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of

The Interlocking Switch and Signal Co., of Harrisburg, Pa.

Sole Owners and Manufacturers of the only practically successful

SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Elec-
tricity.

Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.

Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnish-
ed upon application.

The Fitch Chlorine Battery,

Patented Sept. 16, 1879.



The Cheapest, Cleanest, most Eco-
nomical, Durable, and decidedly the
BEST OPEN CIRCUIT BATTERY

in use for Telephones, Annuncia-
tors, and Electric Bells. After sev-
eral years of constant use, it is pro-
nounced to-day as being far Super-
ior in constancy and power to all
other Batteries, for the above pur-
poses, notwithstanding all state-
ments to the contrary. We have made
several valuable improvements in
this Battery, among which is the
substitution of a noncorrosive and
adjustable clamp, in place of the old
style lead cap, which warrants us in
saying that

THE CHLORINE BATTERY
has no equal in the market, and all
we ask is a trial.

Price, \$1.50 per Cell.

LIBERAL DISCOUNT TO THE TRADE.

PARTRICK & CARTER,

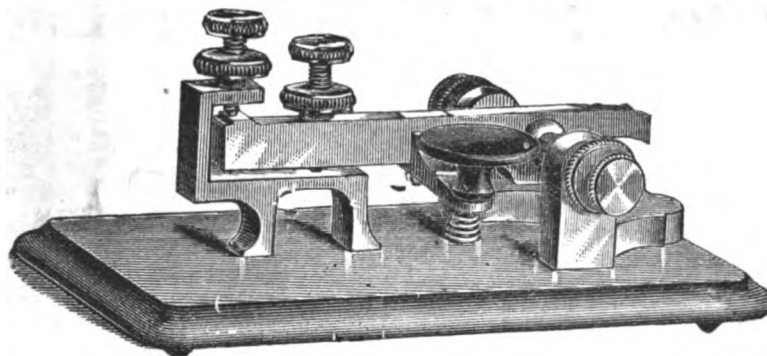
Sole Agents & Manufacturers,

114 South Second St., Philadelphia, Pa.

NEW MECHANICAL

TELEGRAPH INSTRUMENT.

PATENT APPLIED FOR.



COMBINED KEY AND SOUNDER.

No BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is *always ready for use*.

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or register-
ed letter.

J. H. BUNNELL & CO.,

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

ILLUSTRATED CATALOGUES

OF NOVEMBER, 1881?

If not, send your address by postal card or letter and you will get one by return mail

IT CONTAINS

Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instru-
ments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

Don't Read This, or you will be sure and send for our
proper and to your interest to do before purchasing elsewhere. If you want to be-
come a **Telegraph Operator** send twenty-five cents for our new 1882
Illustrated Instruction Book. It is the most complete instruction book
published in the world.

C. E. JONES & BRO.,

Manufacturers and Dealers in Telegraph, Telephone and Electrical Supplies.

51 WEST FOURTH STREET, CINCINNATI, OHIO.

WESTERN ELECTRIC MANUFACTURING COMPANY.

120-122 KIRK STREET, CHICAGO.

62-68 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES.

Insulated Copper Wire, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Fan and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

AMOS STAGER, President. ERNEST M. BARTON, V.-Pres.

ELLEN GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE. |
|---|--------|--------|
| I—Complete Set of Catalogues..... | 208 | 20c. |
| II—Telegraph Instruments and Supplies..... | 64 | 6c. |
| IV—Insulated Wire (included in II). | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 32 | 6c. |
| VI—Electro-Medical Apparatus..... | 32 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 32 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 8c. |
| XI—Magnets for Mills..... | 20 | 8c. |
| See Wm. Thomson's Nautical Instruments..... | 24 | 6c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,

AND

PLAIN AND OILED WIRE OF SUPERIOR QUALITY,

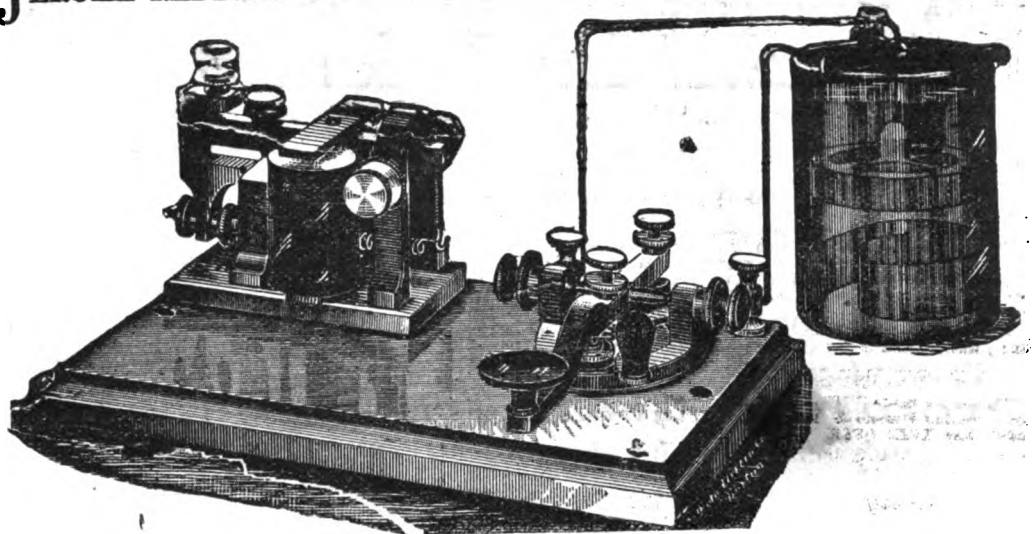
FROM SWEDISH CHARCOAL AND B B IRON.

BUT ONE JOINT PER BUNDLE.

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



PRICE FOR THE "COMPLETE" "GEM" LEARNERS' OUTFIT, \$4.20.

Consisting of the above large-sized Sounder and Key, a good Cell of Calland Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument made that has nicely finished brass Sounder and Key Levers with perfect adjustments for both.*

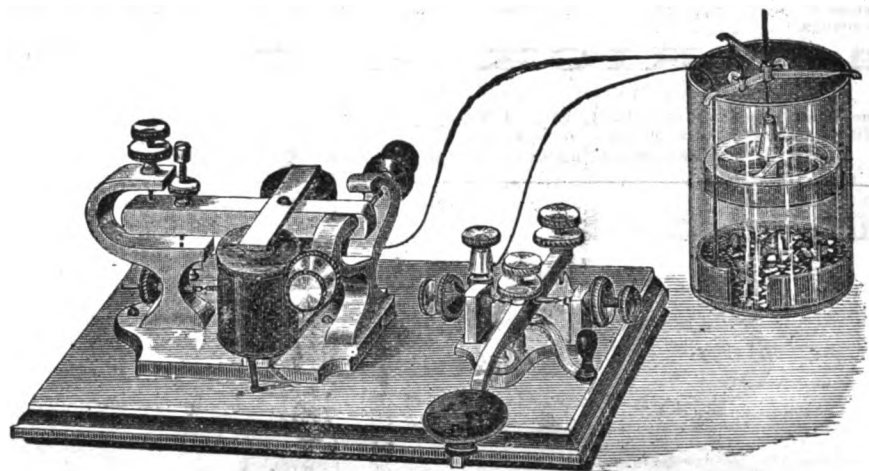
| | | | |
|---|--------|---|--------|
| PRICE for Complete Outfit..... | \$4.20 | PRICE for Instrument alone, for lines 1 to 15 miles.. | \$4.00 |
| " " Instrument alone..... | 2.00 | " " " " " " " " | " |
| " " Instrument alone, by mail, postpaid.... | 4.00 | by mail, postpaid..... | 4.80 |

SEND FOR CIRCULAR.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,

No. 80 HANOVER STREET, BOSTON, MASS.



No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of: Sounder, Key, either on 1 base or separate, 5x7, Calland Battery, Book of Instructions, 15 feet of office wire, 1 pound vitriol. These are a perfect success, sent O. O. D., with privilege to examine before paying for them; send stamp for Catalogue of all kinds of Telegraph Goods.

A. B. LYMAN, 36 South Water St., Cleveland, O.

PARTRICK & CARTER

TELEGRAPHIC SPECIALTIES.

THE GIANT SOUNDER PERFECTED.

Patented Feb. 16, 1875. Most perfect, reliable, clear toned; fine finish, and warranted the best working sounder in existence. Price, by mail, \$5.00.

THE "LATTING" AUXILIARY LEVER NON-STICKING KEY.

PATENTED AUGUST 16, 1881. PRICE, \$5.00, BY MAIL.

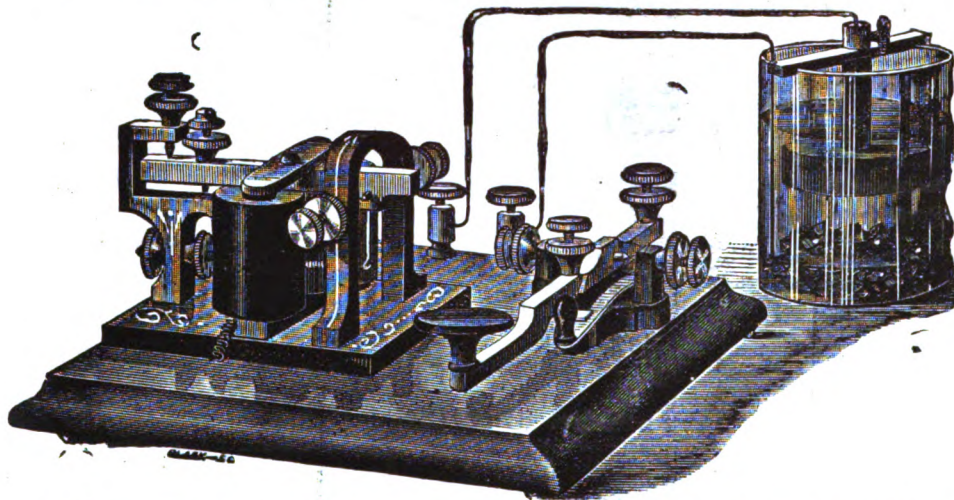
This Key is very fine finish nickel-plated, and presents a beautiful appearance, is easy to handle and WARRANTED NEVER TO STICK. It has been extensively tried and has received the endorsement of the best operators in the country. It embodies the only true principle to prevent a Key from sticking by having a great separation between the anvil and hammer, (without increasing the play of the Key lever,) thereby preventing the formation of the "Electrical Arc" between the platinum points, which is the PRIMARY CAUSE OF STICKING KEYS. We claim this Key will never fail to make contact.

"THE EXCELSIOR KEY." (PATENT APPLIED FOR.) PRICE \$2.50 BY MAIL.

This Key is made ENTIRELY OF BRASS NICKEL PLATED, with hardened platinum points, and it is put forward to meet the long existing demand for a CHEAP, LIGHT, EASY WORKING, FIRST CLASS KEY, and is without doubt the CHEAPEST and BEST Key EVER OFFERED FOR THE MONEY.

Premium Learners' Apparatus.

Only \$5.00. Not the Cheapest, but Guaranteed the Best.



The PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER, PERFECTED," and "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Gallaud Battery, Chemicals, Oil, and Wire, and an excellent Book of Instruction, for \$5.00, when the money accompanies the order. The great number of these Instruments now in use is the best testimonial that can be offered.

| | |
|--|--------------------------|
| Price, Complete Outfit..... | Money in advance, \$5 00 |
| " Instrument without Battery..... | " " 4 20 |
| " Instrument without Battery, by Mail..... | " " 4 75 |

Remittances should be made by P. O. Money Order, Registered Letter, Draft or Express, which will insure safe delivery. Send for circulars.

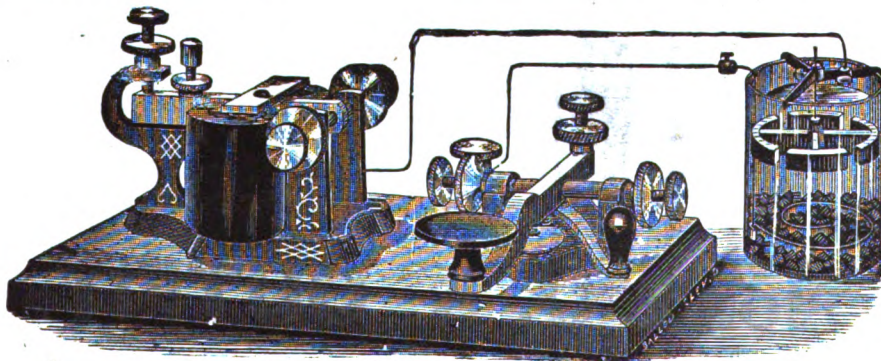
PARTRICK & CARTER,

No. 114 SOUTH SECOND STREET, PHILADELPHIA, PA.,

Manufacturers and Dealers in TELEGRAPH, TELEPHONE, AND ELECTRICAL INSTRUMENTS AND SUPPLIES OF EVERY DESCRIPTION. Send for Catalogues and Circulars.

SEND FOR OUR PRICES BEFORE PURCHASING ELSEWHERE.

EUREKA OUTFIT NO. 2.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK

THE ABOVE OUTFIT AND MATERIAL ALL COMPLETE SENT ON RECEIPT OF \$4.25.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

Room 19, Leader Building, Cleveland,

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

2,164 MEMBERS. \$21,640 RESERVE FUND.

The Association respectfully invites attention to its success during the past ten years, having paid to its beneficiaries over \$175,000, and accumulated a reserve fund of \$21,640, interest upon which nearly pays current annual expenses. No officer or agent draws salary or commission. Average annual assessments to each member has been less than \$12.

Any person, of either sex, in good health of not less than 18 or more than 45 years of age, who is employed in telegraphic service, and is otherwise qualified as required by the By-Laws, is eligible to membership; and should a member in good standing leave the Telegraphic Service, but continue to pay all dues assessed and otherwise conform to the Constitution and By-Laws, he can retain his membership.

The initiation fee is \$2. \$1,000 will be paid to the Beneficiary of a deceased member within 60 days after verification of claim; and in the case of a member who has been one year, next preceding date of death—in good standing the claim is indisputable.

Any one who is or becomes a member in good standing of this Association is also eligible to membership in the new or Second Division. For further information, copies of Constitution and By-Laws, blank applications, etc., apply to any of the following named officers or agents:

OFFICERS:

| | |
|--------------------------------|--------------------------------|
| CLARENCE GARY, President. | O. H. SUMMERS, Vice-President. |
| A. R. BREWER, Secretary. | SAMUEL M. TAYLOR, Treasurer. |
| EXECUTIVE COMMITTEE. | |
| CLARENCE GARY, New York. | O. H. SUMMERS, Chicago, Ill. |
| A. R. BREWER, New York. | SAMUEL M. TAYLOR, New York. |
| W. H. YOUNG, Washington, D. C. | F. W. JONES, New York. |
| JOHN E. ZEUBLIN, Phil. Pa. | CHARLES S. H. SMALL, New York. |
| JAMES MERRITHW, New York. | |

AUDITING COMMITTEE

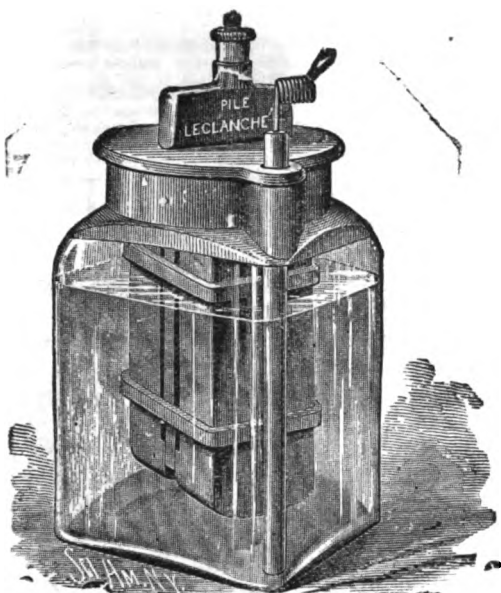
| | |
|-----------------------------------|-------------------------|
| H. O. ROBINSON, Philadelphia, Pa. | T. P. SCULLY, New York. |
| B. W. POPE, New York. | |

AGENTS:

| | |
|--|---------------------|
| Albany, N. Y. | Charles O. King |
| Angusta, Ga. | John W. Brown. |
| Atlanta, Ga. | J. M. Stephens. |
| Baltimore, Md. | B. J. Bixham. |
| Bangor, Me. | H. C. Elias. |
| Bismarck, Dak. | E. O. Greene. |
| Boston, Mass. | E. B. Pillsbury. |
| Buffalo, N. Y. | J. W. Tillinghast. |
| Cheyenne, W. Y. | Chas. F. Annett. |
| Cincinnati, Ohio. | G. W. Sheppard. |
| Chattanooga, Tenn. | Charles H. Skelton. |
| Charleston, S. C. | J. D. Easterlin. |
| Chicago, Ill. | J. Uhrig. |
| Cleveland, Ohio. | E. L. Melton. |
| Columbus, Ohio. | O. W. Ross. |
| Denver, Col. | W. B. Rundle. |
| Dubuque, Iowa. | F. I. Benson. |
| Detroit, Mich. | T. W. Hill. |
| Elkhart, Ind. | S. P. Wilcox. |
| Evansville, Ind. | N. M. Booth. |
| Grand Rapids, Mich. | E. D. Benedict. |
| Galveston, Texas. | David Hall. |
| Grafton, W. Va. | A. T. Cline. |
| Harrisburg, Pa. | H. A. Clute. |
| Halifax, N. S. | Alex. E. Hoyt. |
| Hartford, Conn. | S. B. Curtis. |
| Indianapolis, Ind. | F. A. Moore. |
| Jackson, Mich. | D. S. Fleming. |
| Jackson, Tenn. | Nelson E. Jacobs. |
| Kansas City, Mo. | M. D. Wood. |
| La Fayette, Ind. | H. E. Doolittle. |
| Little Rock, Ark. | E. C. Newton. |
| Louisville, Ky. | Charles Smith. |
| Mobile, Ala. | B. P. Shreve. |
| Montgomery, Ala. | E. Winter. |
| Memphis, Tenn. | C. Reddy. |
| Milwaukee, Wis. | D. H. Henshaw. |
| Montreal, Quebec. | James Kent. |
| Nashville, Tenn. | A. H. Stewart. |
| New Haven, Conn. | J. M. Fairchild. |
| New Orleans, La. | J. T. Alleen. |
| No. Sydney, C. B. | Nath'l Martell. |
| New London, Conn. | G. W. Russell. |
| N. Y. L. Erie & W. R.R. (21 Cortlandt St. N. Y.) | C. D. Reed. |
| Oil City, Pa. | Frank Ross. |
| Omaha, Neb. | L. M. Rheem. |
| Philadelphia, Pa. | Wm. G. Jones. |
| Phillipsburgh, N. J. | G. H. Grace. |
| Peoria, Ill. | J. E. Ranney. |
| Pensacola, Fla. | O. L. Le Baron. |
| Pittsburgh, Pa. | J. E. Palmer. |
| Poughkeepsie, N. Y. | S. K. Bupley. |
| Portland, Me. | C. D. Livermore. |
| Portland, Oregon. | D. F. Leahy. |
| Providence, R. I. | Edgar M. Dexter. |
| Reading, Pa. | W. H. Runyon. |
| Richmond, Va. | W. O. Walstrum. |
| Rochester, N. Y. | A. J. Stoddard. |
| Reno, Nevada. | Frank Bell. |
| Savoy, Pa. | H. H. Hamilton. |
| Scranton, Pa. | B. O'Brien. |
| Syracuse, N. Y. | Luther G. Field. |
| St. John, N. B. | B. T. Clinch. |
| St. Louis, Mo. | W. H. Stanton. |
| St. Paul, Minn. | Day K. Smith. |
| San Francisco, Cal. | A. P. Dubois. |
| Savannah, Ga. | H. Griffith. |
| Springfield, Mass. | W. J. Denver. |
| Springfield, Ill. | W. W. Kelchne. |
| Toronto, Ont. | J. Lanskill. |
| Troy, N. Y. | F. D. Adams. |
| Toledo, Ohio. | J. P. Church. |
| Vincennes, Ind. | Perry Hood. |
| Washington, D. C. | W. H. Young. |
| Wheeling, W. Va. | Jno. C. Tomlinson. |
| White River Junction, Vt. | G. W. Gates. |
| Wellsville, Ohio. | P. Bruner. |
| Worcester, Mass. | E. W. Bradford. |
| Watertown, N. Y. | D. Van Nostrand. |

A. R. BREWER, Sec'y.

P. O. Box 3175. New York.
W. U. T. Building, Room 58.

LECLANCHE BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones,
And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Placques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of IMITATIONS and WORKLESS IMITATIONS.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity
Mine and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,
40 West 18th St., New York.

Or L. G. TILLOTSON & CO.,
5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FIBERED

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLES, ETC.

OFFICE AND FACTORY: 67 STEWART STREET.

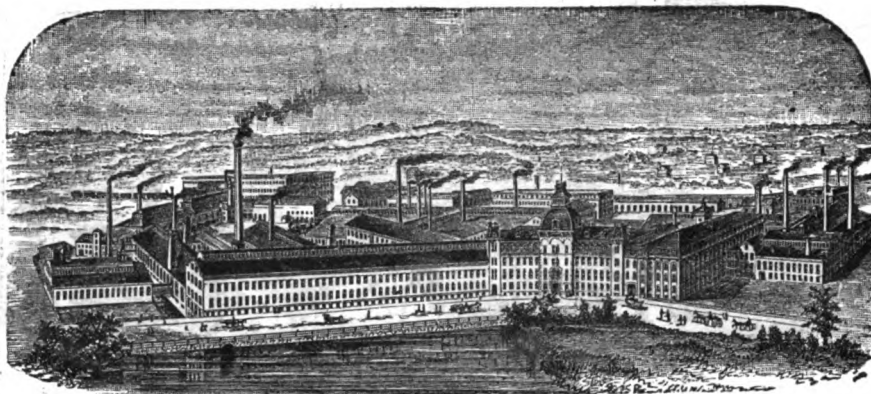
PROVIDENCE, R. I.

W. H. SAWYER, Electrician and Sup'l.

TELEGRAPH WIRE.

WASHBURN & MOEN MANUFACTURING COMPANY.

ESTABLISHED 1851. CAPITAL \$1,500,000.



WORCESTER, MASS.

21 OLIVE STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequaled in that particular.

Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

(In connection with the DOUBLE ROLLING FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

KERITE INSULATED TELEGRAPH WIRES AND CABLES

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by
all the leading men in the telegraphic profession

THE

DURABLE QUALITIES OF KERITE

RECOMMEND IT AS THE

CHEAPEST AND MOST ECONOMICAL

Insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND
CABLES

of any number of conductors or size of insulation furnished
at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic
material.

further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

B. HOSCHKE, General Agent,

TELEPHONE WIRE.

THE AMERICAN BELL TELEPHONE COMPANY.

W. H. FORBES, President, W. K. DRIVER, Treasurer,
THEO. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

ALL persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

The "Morse" Learners' Instrument.

THE BEST.

THE "MORSE"

Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

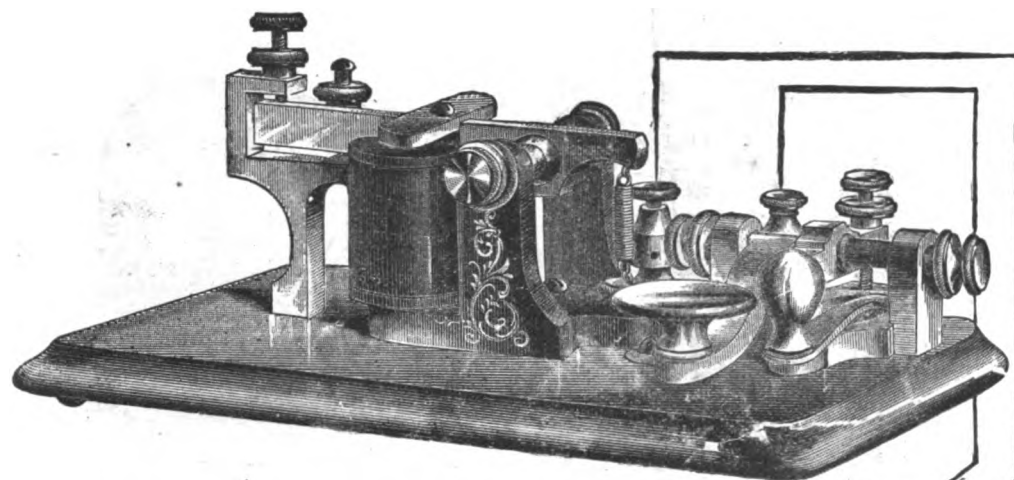
It is the best working set of Learners' Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

You are SURE of getting THE BEST THAT IS MADE

IF YOU SELECT THE "MORSE."

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.



THE BEST.

Price, \$450, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.

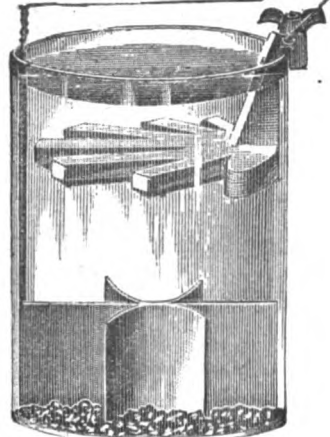
| | |
|---|--------|
| "Morse" instrument alone, without battery..... | \$3.80 |
| "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... | 4.50 |
| Cell of battery complete..... | .65 |
| "Morse" Learners' Instrument, without battery, sent by mail..... | 4.30 |

(Battery cannot be sent by mail.)

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.



YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "73," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 either designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys, Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents;

also Embellished Keys 25 for 25 cents. Samples of Operators' Cards 10 cents. 50 New and laughable Illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 20c. 25 side-splitting Comic Cards, 20c. Morocco card cases, two pockets, 10c. 100 finely printed letter heads, \$1.00. 100 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 10c. Agents Wanted to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also set in fringe edge, and ribbon bows on turn over corners. Elegant Horse shoe and slipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200, no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from \$ to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,

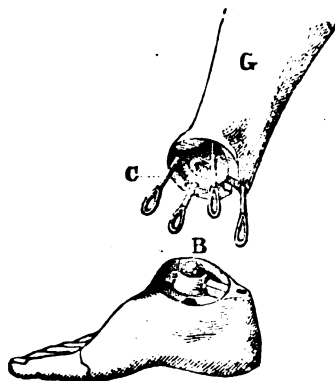
F. P. MUNN, CLYDE, Wagon Co., N. Y.

WESTERN UNION TELEGRAPH COMPANY,
New York, December 14, 1881.
DIVIDEND No. 58.

The Board of Directors have declared a quarterly dividend of ONE AND ONE-HALF PER CENT. upon the capital stock of this company from the net revenues of the three months ending December 31st, instant, payable at the office of the Treasurer on and after the 16th day of January next, to shareholders of record on the 20th day of December, instant.

The transfer books will be closed at three o'clock on the afternoon of the 20th of December, instant, and re-opened on the morning of the 17th of January next.

R. M. LOCKMETER, Treasurer.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
With or without universal ankle motion. Remodeled, improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.

GEO. E. FULLER,
Successor to Dr. D. BLY, Rochester, N. Y.

BEST TELEPHONE EXCHANGE SWITCH BOARD.

IN THE WORLD.

SUPERSEDING ALL OTHERS.

Sample and Circulars sent to Exchanges on Application to

C. E. JONES & BRO.,

CINCINNATI, OHIO.

WESTERN

SCHOOL OF TELEGRAPHY.

JANESVILLE, WISCONSIN.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement, now of eight years standing, with the system of city lines in Chicago known as the Metropolitan Telegraph Company, having over 100 offices, and worked in connection with the Western Union Telegraph Company. These city lines draw their operators from this school, placing them first in sending offices and afterwards promoting them according to merit. The superintendents of telegraph of the different railroads centering at Chicago, employ many men from the city lines, and the Western Union Company does the same, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make of our students first class operators, nor to obtain for them first class situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

RICHARD VALENTINE, } MANAGER.
A. M. VALENTINE, }

N. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have lately furnished the following Companies in this way: Wisconsin Central, Green Bay & Minn.; St. Paul, Winona & Lake Superior; Chicago & North Western; St. Paul, M. & Omaha; Burlington & Northwestern.

We can so furnish, on short notice, experienced operators competent to manage any ordinary office, and reliable in every respect.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, FEBRUARY 16, 1882.

WHOLE NO. 343.

GROVE'S, PLANTÉ'S, AND FAURE'S SECONDARY BATTERIES.

BY PROF. W. GRYLLS ADAMS, F.R.S.

(Concluded from page 34.)

The electro motive force of a single cell of Planté's battery is about $2\frac{1}{2}$ volts, or $2\frac{1}{2}$ times that of a Daniell's cell, i.e., about $1\frac{1}{2}$ times Grove's cell, hence, two cells of Grove will charge a Planté cell. The quantity of electricity that may be collected will depend on the amount of chemical action, i.e., on the extent of the surface of the plates, and on the way in which that action has gone on. When the action has gone on rapidly the battery will not be so good as when the action is slow. The Planté battery, as usually formed, discharges itself too rapidly for many purposes for which electric accumulators are now required, and hence other secondary batteries or modifications of the Planté battery are now making their appearance. The cells may be charged by a dynamo-machine, and may also be used to drive a dynamo-machine like an electro-magnetic engine or motor, driving it in the same direction as it was driven when used as a generator to charge the cells.

The Planté cell will also heat a platinum wire of considerable diameter, for although the electromotive force is only $2\frac{1}{2}$ volts, yet the quantity is sufficient to make a platinum wire 3-10ths mm. in diameter and 4 cm. in length to glow for half an hour.

The secondary battery may be made use of in telegraphy to do away with the residual magnetism in an electro-magnet, so as to enable it to work more quickly after a current has been sent through it. The secondary cell should be attached with its positive pole to the line, and its negative pole to the key, the other end of the line or the earth being also attached to the key, so as to form a complete circuit when the key is up; the sending battery, consisting of two or more cells of Grove, or at least three Daniell's cells, should have its negative pole attached to the negative pole of the secondary cell and its positive pole to the key, so as to form a complete circuit with the line and secondary cell when the key is down. When contact is made with the sending battery by putting down the signalling key, the circuit is sent through the secondary cell into the line, thus giving a slight additional charge to the secondary cell, and bringing the electro-magnet into action; on breaking contact by releasing the key, the secondary cell, being still connected to the line, sends a reverse current into the line, and weakens or may even be strong enough to reverse the magnetism of the electro-magnet. If we work a Morse instrument first, with the sending battery alone, and afterwards with the secondary cell in the circuit, we find that there is a very great increase in the rate of signalling when the secondary cell is used. The secondary current increases as the battery current increases, and, being in the reverse direction, instantly weakens the magnetism

of the electro-magnet, so that signals may be sent as fast as the operator can make and break contact. Planté's secondary battery has been employed to work an electric break on railway trains. With two Grove's cells, or three Daniell's cells and a Planté cell arranged as above described, the Planté cell is continually being charged, or is kept from getting weaker, except when the key is depressed, which completes the electric circuit by which the break is set in action. The quantity of electricity stored up in six Planté's cells suffices, with such an arrangement, to prevent the cells from becoming exhausted, to work the breaks on a dozen railway carriages, and to last for a fortnight. To renew the charge in the Planté cell a battery of six Daniell's cells may conveniently be employed. It is important that the charging should be carried on with great regularity, so that the layer of peroxide of lead may be regularly laid on, otherwise it will not adhere well to the lead electrodes.

Several forms of secondary batteries have appeared quite recently, now that the demand has arisen for a reservoir in which to store up the electricity produced by the dynamo-electric machine, and the secondary action or polarization of batteries is no longer regarded as something to be avoided as much as possible, but is eagerly sought after. Professors Houston and E. Thomson, of Philadelphia, have tried electrodes of copper in sulphate of zinc. When a current is sent through the cell, zinc is deposited on the negative pole, and sulphate of copper formed around the positive pole, the plates being laid horizontally, so that the sulphate of copper so formed and the sulphate of zinc shall be prevented by their relative weights from mixing too readily.

This we may call a gravity secondary battery, and its electro-motive force will be nearly the same as that of one Daniell's cell, or 1 volt. M. d'Arsonval modifies this battery by using one electrode of lead and another of zinc in a solution of sulphate of zinc. The lead forming the positive electrode becomes coated, as in the Planté's cell, with peroxide of lead.

Several modifications of Planté's cell have been suggested, which have for their object the reduction of the weight of lead employed; such are the batteries of M. de Pezzer and M. de Meritens, who fold their laminae of lead in layers like the leaves of a book, so as to get as much surface as possible for a given weight of lead. M. de Pezzer also finds that the relative size of the positive and negative plates modifies the results obtained, a greater quantity of electricity is stored up when the negative electrode is double the size of the positive electrode than when the two electrodes are of the same size.

Other modifications, in which the negative pole is either paladium in dilute sulphuric acid or thin sheet iron in a solution of sulphate of ammonia, have been suggested and employed by M. Rousse, these substances being chosen on account of their

great power of absorption of hydrogen. These can hardly be called secondary batteries, since two metals are employed as electrodes.

The method of charging secondary batteries may sometimes be conveniently made use of to renew ordinary batteries which have become used up. Thus, a Leclanché cell which has been in use for a long time, and becomes weak, may be recharged again by connecting up the positive pole of a stronger battery with the positive pole of the Leclanché battery, and allowing the current to pass through it for a considerable time. The secondary battery to which most attention has been drawn during the last few months is the Faure battery, in which M. Faure does not form the cells by electrolysis, but coats the lead plates with a film of red lead or minium, enclosing or protecting the red lead coating with a layer of felt. His cells are of large size, and each is therefore capable of storing up a considerable quantity of electrical energy. The chemical action is similar to the action in a Planté cell, but the resistance is higher, and when in use the battery takes longer to discharge itself, so that for electric lighting and for many purposes for which a store of electricity is required it seems to be better adapted than the Planté cell. It has been said, and the statement has been confirmed by Sir William Thomson, that a "Faure accumulator, weighing 75 kilogrammes (165lb.), can store, and give out again, energy to the extent of an hour's work of one horse-power," or two million foot-pounds. At first these cells were made cylindrical, and the Faure Accumulator Company have kindly lent me a box of four such cells in action, similar to the celebrated box of electrical energy or condensed lightning, so graphically described in *The Times* of May 16 last, which was carried from Paris to Glasgow for examination and measurement by Sir W. Thomson. They have also lent me one of their latest forms, in which the plates are flat, and placed vertically in the box. It has been ascertained by Sir W. Thomson that Faure's accumulators, amounting in weight to three-quarters of a ton, will continue to work for six hours from one charge at the uniform rate of one horse-power, and that probably 90 per cent. of the energy spent in charging will be transformed into useful work. Very few comparative trials have been made of the Planté and the Faure batteries, but from those which have been made by M. Achard, it appears that, as might be expected, they are equal in electromotive force, that the Planté cell is of smaller resistance than the Faure cell, and, consequently, will heat a longer piece of platinum wire, and do its work three times as rapidly. The Planté cell kept a platinum wire 3-10th mm. in diameter and 5 or 6 cm. long red hot for half an hour, and the Faure cell kept the same wire red hot for an hour and a half. We may readily see by a few experiments that the Faure's battery has collected a great quantity of electrical energy, for one box of it will cause a platinum wire of considerable length,

and 1mm. in diameter, to glow, and one cell is sufficient to drive a small dynamo-electric machine as a motor, or to drive a small electric engine, and the three or four cells are sufficient to cause a small Swan's incandescent lamp of small resistance to give out a very pleasant light of about two candles. There are many applications which may be made of secondary batteries. Six Planté cells have been found sufficient to drive a tricycle with 160 kilogrammes, or about 300lbs. upon it, at a rate of ten miles an hour, or to drive a boat containing three persons.

(1). These secondary batteries may be used to carry a supply of electricity where it is wanted.

(2). They may accumulate supplies from a dynamo machine, and store energy up for electric lighting or for motive power.

(3). They may serve as regulators for the electric current, when as in electric lighting it is liable to fluctuations, either from the irregularity of the driving engine, or from the change of resistance in the electric arc or in the electric circuit. When so used, they would supply and keep up the light, even though the engine were suddenly to stop, or any accident to happen other than the cutting of the connecting wires.

The Faure's Accumulator has been employed to light a railway train from London to Brighton by means of incandescent lamps, to work an electric motor so as to drive a circular saw or other mechanical tools, and it has been employed with very satisfactory results in driving a tramway in the streets of Paris, and in the Siemens electric railway between the Electrical Exhibition and the Place de la Concorde. The results already attained seem to show that there is no other secondary battery which can compare with this for storing up and keeping for a long time a supply of electric energy, and for using it slowly when in action.

UNIFORM TIME—ENGLISH TIME IN AMERICA.

THE Signal Service authorities in Washington, says a correspondent of the New York *Herald*, are talking about establishing a time-ball service on the Equitable Building in New York, to give Greenwich time to the great shipping interests of New York Harbor. Nearly all the vessels engaged in the Atlantic trade regulate their time by the Greenwich standard, and have therefore to encounter considerable trouble, when in any American or foreign port, to ascertain how their chronometers are running. (The United States government prepares a bulky compilation in which the seaports of the world are named and the variation from Greenwich time in each port given. While these computations run through hours, minutes, seconds, and even hundredths of seconds, the shipmaster still meets with difficulties. He has to send his chronometer to have it regulated, often at inconvenience and always at expense. But the time ball dropped several times per day on the Equitable Building would remedy all this and give exact Greenwich time in so far as New York harbor is concerned at least. Professor Leonard Waldo, professor of astronomy at Yale College, in charge of the Horticultural Bureau of that institution, has conferred with Gen. Hazen on this subject, and, although all the necessary arrangements have not yet been made for the move, nor in fact, any definite details agreed upon, it is well known that these two gentlemen consider the plan to be one of service to navigators, and are desirous that it be put in operation as soon as possible.

CONVENIENCES OF GREENWICH TIME.

Professor Waldo is at present in Europe, procuring astronomical instruments and attending to other matters of interest to Yale College. He is not expected to return for several weeks. In his absence no one is authorized to speak for him in relation to this project of time reform and others yet in embryo. Those to whom your correspondent spoke on the subject say that the Signal Service is at the helm of the movement, it being one of benefit to shipping interests. Professor Waldo is to take the observations at the Yale Observatory and furnish the true Greenwich time at different hours each day to the Signal Service station in New York, where it would be recorded by the ball system. This would obviate the necessity of cabling from Greenwich. If the Greenwich time should be so adopted by the Signal Service, which is at liberty to adopt any other if desirable, that adoption might lead to very important changes in the entire system of keeping time on the Atlantic slope at least, and possibly in the valley, mountain and Pacific slope country. A gentleman who has made the subject of uniform time service for the guidance of all kinds of business a special study, but who did not desire to have his name used, said to your correspondent:—There are few difficulties in making the difference between Greenwich time and our time a matter of exact hours. The odd minutes over exact hours between the time of Greenwich and Philadelphia are very few, and the Philadelphia time can easily be made the New York time. I need only say that New York city time has been the legal time of the State of Connecticut by the law of the last General Assembly, to show you that no special inconvenience could be caused east of New York; for while our time really differs from New York time, it is made legally the same. No inconvenience has been caused, for probably only a small percentage of people know that there has been any change at all. People regulate their business by their clocks, and not by the sun. By the way, the time of noon is seldom accurately shown by clocks, for the days lengthen and shorten faster at one end than at the other.

UNIFORM TIME.

"The way uniform time could be established is this, providing the trunk railroad lines would co-operate:—At Chicago it would be necessary to take something like the time of St. Louis, then time would be taken again at Denver for that section and again at Sacramento City or San Francisco for the Pacific slope. A passenger going west would certainly encounter new time at Chicago and again at Denver, but it could be computed in even hours—there would be no minutes to trouble him, and Greenwich or some other time would be made practically the uniform time for the entire country. In the East there are 12,000,000 of people within twelve minutes of Philadelphia time, and a slight change could be easily effected and would secure uniformity. The Signal Service can adopt any time, but I hear that Greenwich time is preferred.

ACTION OF THE INTERNATIONAL CONGRESS.

The following resolutions relative to uniform and standard time were presented to the International Congress recently held at Venice, Italy, by the American delegates, Barnard, Hazen and Fleming and their substitutes, Daly and Wheeler, (who respectively represented the former two):—

Resolved, 1. That the unification of initial meridians of reference for computing longitude is of great importance in the interests of geography and navigation.

Resolved, 2. That the selection of a zero meridian for the world would greatly promote the cause of

general uniformity and exactness in time reckoning.

Resolved, 3. That in the interests of all mankind, it is eminently desirable that civilized nations should come to an agreement with respect to the determination of a common prime meridian and a system of universal time reckoning.

Resolved, 4. That the governments of different countries be appealed to immediately after the close of this Congress, with the view of ascertaining if they are disposed to assist in the matter by nominating persons to confer with each other and endeavor to reach a conclusion which they would recommend their respective governments to adopt.

Resolved, 5. That, in view of the representations which have come to this Congress from America, it is suggested that a conference of delegates, who may be appointed by the different governments, be held in the city of Washington, and that the conference open on the first Monday in May, 1883.

STANDARD TIME IN THE UNITED STATES.

At present there are said to be more than seventy distinct "railroad times" in the United States; in some single cities there are as many as four, differing from each other by amounts varying from five to twenty minutes. This state of things of course involves confusion and inconvenience to travellers, and all Americans travel. In some cases it has been the cause of serious disasters.

It is beyond doubt, then, that there would be great advantages in a uniform standard of time for the whole country. Can they be secured without too much counterbalancing, inconvenience and expense? We believe they can, and without any very great difficulty.

A single standard for the United States (and still more, for the whole world), while in many respects highly desirable, would be exposed to the fatal objection that it would bear no relation to the true local time determined by the sun's position. Now this local time is what we must necessarily live by. Nature compels us to work by day and sleep by night; to rise in the morning and retire at evening. A time standard which does not recognize this cannot be practically convenient, and will never be adopted. Suppose, for instance, that Washington time were made the standard for the country; at San Francisco everything would be three hours out of joint; and though undoubtedly, such good people as live there, and always stay at home, could, after a while, become accustomed to having noon come at 3 o'clock by their watches, and other things to match; yet there would probably be some grumbling first. Changes so radical are always hard to accomplish. But, what is worse, whenever the San Franciscan journeyed, or changed his residence, he would have to unlearn all his time-relations, and begin again.

In fact, if a uniform time-standard were adopted over the whole world, all allusions to the time of day in literature now existing, such statements of the hour as are involved in almost every accurate description of an event, would become unintelligible except by a process of translation.

The late Professor Pierce proposed a plan, which, while securing most of the advantages of the uniform standard, avoids its worst difficulties. It is to adopt, not one standard for the country, but a series of standards, (four would be needed) agreeing exactly in their minutes and seconds, but differing by entire hours. We should then have Atlantic time, Mississippi time, Mountain time, and Pacific time. Since the minutes and seconds would be everywhere the same, telegraphic signals from a

correct clock would be directly available for regulating the time wherever received; the difference of one or more entire hours could never cause confusion. And yet the standard time at any place need never differ more than thirty minutes from the true local time. This amount of difference, though of course in itself undesirable, is not so great as to be intolerable in view of the attendant advantages. We hardly notice the discrepancy of fifteen minutes between sundial and clock, which occurs at certain seasons of the year, in consequence of the Equation of time.

As to the time to be chosen for the standard of minutes and seconds, unfortunately there is not yet an agreement among our astronomers. Naturally enough many think it should be Washington time, just as in England, Greenwich time is used. So far as landmen are concerned it is really a matter of almost no importance what time is selected, but with the shipping interest it is different. Almost all nations use Greenwich time on the ocean; and for this reason it would probably be best to lay aside national prejudice, and make our Atlantic time differ from Greenwich time by just five hours; this would agree with the correct local time for a meridian passing between New York and Philadelphia. The meridian of Mississippi time (six hours from Greenwich) would then pass between Chicago and St. Louis, that of mountain time would run near Denver, and the Pacific meridian near San Francisco.

The meridian theoretically dividing Atlantic from Mississippi time would nearly bisect the State of Ohio. In a case of this sort the legislature would be likely to adopt one or the other of the two times as the standard over the whole State; so that in practice the boundaries between the standards would probably follow State lines.

The establishment of some such system need not be very difficult or long delayed.

The Signal Service proposes to receive by telegraph, from such observatories as choose to co-operate, their respective time-determinations; to combine them, and then to transmit the resulting standard-time daily to every important place in the country; besides this, at every port they would drop a time-ball, at some exact hour of Greenwich time, so that navigators would be able to rate their chronometers.

At present we have a number of more or less extensive and accurate time-services run by different observatories. But the signals sent out are more or less discordant, not unfrequently to the extent of one or two entire seconds, for the simple reason that no clock can be depended on for any length of time unchecked by star observations; and such observations are sometimes prevented by cloudy weather for several days together. Since it would seldom happen that the observatories in widely different parts of the country would all have bad weather at once, the Signal Service plan would obviate the difficulty. The most serious objection to the proposal seems really to be that the observatories which now distribute time would lose the revenue they derive from the work, unless, indeed, as would be only fair, the Signal Service should continue to pay them for their observations the same compensation they now receive.

If the Signal Service can obtain from Congress the small appropriation they ask for (\$25,000) to carry out their plan, and if the railroad, steamboat and telegraph companies will adopt the standard time and use it exclusively in their business advertisements, the thing is done. The community will follow suit and hardly notice the change.

O. A. Youne, in *Science*.

STATE WEATHER BUREAUS.

General Hazen, who since his appointment to the position of Chief Signal Officer has made several changes in the service that cannot fail to call forth the approval of the public, now proposes a scheme which, if developed, will prove of great benefit to every one. Over the broad expanse of territory lying between the Rocky Mountains and the Atlantic coast line the Signal Service Bureau have about ninety stations, from which are sent to Washington three daily meteorological observations. By charting those reports the location and character of the areas of high and low pressure are discovered, and upon them depend the weather forecasts that are made every day at the central office. Owing to the small number of the stations they must necessarily be very far apart; hence General Hazen's proposition, which is as follows: Each State in the Union should have an independent weather service for the purpose of gathering and utilizing local climatic data. By such a system the people would in time become conversant with physical conditions of every locality and be guided thereby. In the tornado season the results of observations in temperature and humidity would be invaluable, because they would enable a correct forecast of their development to be made.

HOW OPERATED.

The State Weather Service may be wholly volunteer and under the charge of a director or superintendent appointed by the Governor, or it may be made a part of the duties of some officer now authorized by law, such as the Surveyor General, the Superintendent of Public Instruction, the president of some State college, &c. The observer in each county may be a volunteer, or it may be made the part of the duty of some county officer to make a daily record and monthly report. Observations should be taken if possible at all State, county and municipal offices and institutions, such as jails, asylums, hospitals, libraries, colleges, high schools and waterworks, and by tollgate keepers, surveyors, canal lock keepers, &c. The instruments used should, when practicable, be of uniform patterns, carefully tested before use by comparison with known standards, and should include at least one maximum and minimum thermometer, one dew-point or other hygrometer and rain gauge, all which, with a supply of blanks and stamped envelopes for one year, need not cost more than \$15 per station. The director should be fully impressed with the importance of the work and should issue each month a "Review of the weather," as obtained from the State observations; this review to be furnished to each county paper for publication and to each observer within ten days after the close of the month. The Chief Signal Officer will furnish sample forms, instructions for taking observations, price list of standard instruments, and give any information relative to this subject which the experience of the Signal Service may afford. Systems similar to the above are now in successful operation in Missouri and Iowa, and will soon be organized in Indiana, Kansas, Illinois and Nebraska. When all the States east of the Rocky Mountains have their separate weather services, and those co operate with the Washington Bureau, the resultant accumulation of meteorological data will be invaluable. For the benefit of our legislators a specimen "act" on the subject is given below:

AN ACT to establish a central station of the Iowa Weather Service and for the appointment of a director thereof—Laws 17, General Assembly, State of Iowa, chapter 45.

SECTION 1. Be it enacted by the General Assembly of the State of Iowa that there be and hereby is established at Iowa City a central station for the Iowa

Weather Service, with Gustavus Hinrichs as director thereof, and in case of his death or disability his successor shall be appointed by the Governor.

SEC. 2. The duties of said director shall be to establish volunteer weather stations throughout the State and supervise the same; to receive reports therefrom and reduce the same to tabular form, and report the same quarterly to the State printer for publication in the form of the Iowa weather reports.

SEC. 3. That the State printer be authorized to print 2 000 copies of the said Iowa weather report quarterly, 1,000 copies of which shall be distributed by said director and 1,000 copies delivered to the Secretary of State to be by him distributed in the same manner as other State documents.

SEC. 4. That there is appropriated the sum of \$1,000 annually, or so much thereof as may be necessary, for the purpose of meeting the actual expenses in carrying out the provisions of this measure; but no part of said sum shall be used in payment of salaries to any officer or officers, except for clerk hire and upon the order of said director.

SEC. 5. This act, being deemed of immediate importance, shall take effect and be in force from and after its publication in the *Iowa State Leader* and the *Iowa State Register*, newspapers published at Des Moines, Iowa.

PROGRESS OF ELECTRICITY.

THE construction of the electric railway between Weisbaden and Neroberg has been begun.—An interesting trial will shortly be made on the river Spree of a method of employing electricity for tugging sailing vessels.—The American Electric Railway and Power Company filed articles of association on October 24th, capital, \$10,000,000. The principal office will be in New York.—It is said that Congress is to be asked to vote \$50,000 to introduce electric light into several lighthouses on the American coast which are at present without it.—The municipal council of Paris are so pleased with the electric railway that they are thinking of trying the experiment of an elevated railway in some parts of the city, the motive power for which shall be supplied by electricity.—The question of electric lighting for Berlin is at present in abeyance pending the report of a municipal commission, who have been appointed to visit London and Paris and make observation on the methods in vogue in these two cities.—It is reported that the Gramme patents for the transmission of motive power by electricity have become the property of a company constituted with a capital of £408,000, under the auspices of the Societe Internationale des Telephones.—Siemens Bros. & Co. (Limited) intend applying to Parliament for power to break up streets, etc., to set up apparatus for lighting public and private places and buildings by electricity.—The Clyde navigation trustees are at present experimenting with the light at their docks, and it is their intention to adopt it permanently, at least for the graving docks, to that operations may be carried on during the night.—Last week the galleries of the Glasgow Institute of the Fine Arts were lighted up for the first time by Messrs. D. & G. Graham.—An offer has been made to light the carriages of the Northeastern Railway Company by electricity at half the cost of oil.

DR. STEPHAN, Secretary of the Imperial Post Office, Berlin, does not believe that houses are endangered by overhead telephone wires, but he says that it is important that in arranging the wires due provision be made that atmospheric discharges of electricity find a ready path to earth.

Journal of the Telegraph.

PUBLISHED SEMI-MONTHLY AT 195 BROADWAY.

THE JOURNAL is issued on the 1st and 16th of each month. Its circulation is over 17,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,730 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage inc'd.....\$ 2.00
One Copy, six months, postage inc'd..... 1.00
Single Copies, 10 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$ 2.00
Half Inch " " "..... 1.00
Quarter Column, " " "..... 4.00
Half " " "..... 8.00
One " " "..... 16.00

Outs charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, FEBRUARY 16 1882.

THE UNIFORM TIME FALLACY.

ONE of the most startling theories of the present day is that of having universal time in all parts of the world without regard to the position of the sun only at one point in the world. That point would practically be Greenwich, England, because the time furnished by that astronomical observatory regulates nearly all the vessels engaged in the Atlantic trade, and it is by that standard that navigators rate their chronometers. That all shipping in New York Harbor should be able to get exact Greenwich time, to be furnished by the U. S. Signal Service by a time ball dropped several times a day is undoubtedly desirable, but this is the extent of a desirable attempt to establish uniform time, even in the United States, or at a few points as a standard for a certain district, will be obvious to any person who will think of the subject in a practical way, yet strange as it may seem there are many men in science in America who sincerely believe in and advocate the system to be generally applicable and desirable in the United States, and the subject has gone so far that the U. S. Signal Service has asked Congress for an appropriation of \$25,000 to carry out a plan to furnish standard time from a few points in the United States which the railroad, steamboat, and telegraph companies are expected to adopt and use exclusively in their business, and then it is expected that the public will soon follow it. This reminds one of the story told by Oliver Wendell Holmes of a fancied attempt to make the people in the moon hear us on this earth, and that was for a day to be fixed for all the inhabitants of this earth to scream out simultaneously, with one voice as it were, and that thereby the attention of the inhabitants of the moon would be attracted to us, and perhaps a communication could thus be started. The time came and every one listened so intently to hear the noise that he

forgot to scream himself, and the result was that the world was never so still as on that occasion. If a similar attempt should be made to materially change the present system of standard time now in universal use it would never be found so accurate and thought so much of and adhered to so strongly as on such an occasion.

While we have not seen any arguments against the change of the present system of time, which is practically regulated by the position of the sun in the meridian, and is properly called apparent time, we have no fears or doubts of its remaining in use in the United States and the world as at present. In another column we print two articles, one from the New York Herald and the other from Science, both are strongly in favor of the change, and yet there is no good reason shown for the change.

The strong point in favor of the present system is that its convenience and use is based upon facts and general experience of the senses, and not upon mere theories, as is the proposed new system, which is founded upon purely arbitrary and fictitious suppositions, the effect of which is that the middle of the day with the sun at the meridian at the point of the standard of time, say at Washington, will be twelve o'clock, while at a distance west of that point, say San Francisco, the middle of the day with the sun at the meridian, when it arrives there, will be at three o'clock, P. M., by the time there, and all the intermediate points will be proportionately affected in the same way. While east of Washington, say Augusta, Me., the middle of the day will be at 10 A. M., and all the intermediate points east of Washington affected in the same way, in proportion to their distance east of Washington.

If so called scientific men or others wish to adopt an arbitrary standard of time to extend over the world, or over a continent, they may do so for their own use, but to attempt to force the general public to use it (it can only be adopted by State legislation) will be like the fable of the fox without a tail, only founded on less reason and less general utility and convenience. At this age of the world, indeed, since the introduction of the Baconian system of philosophy by induction founded on experience and facts, all science and theology has been forced to give way more and more to its teachings. Hume's arguments against the doctrine of divine miracles was that it was contrary to experience, and Darwin's system is upon the sound basis of experience. In regulating our affairs we rely mainly upon this more than anything else. When leading men of science disregard this, and their views are sustained by the public, we shall be in the dark ages, black as night. The world may have another deluge, but the dark ages among the people are passed forever.

If you want to become a telegraph operator, send twenty-five cents to O. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

POWERS OF TELEGRAPHIC CURRENTS.

A REGULAR weekly meeting of the Polytechnic Association was held in New York city, on Thursday evening, February 9th, 1882, the President, Thomas D. Stetson, in the chair.

Drs. Lambert and Vanderweyde successively exhibited and explained specimens of the perforated paper used in sending dispatches, and the two lines of marks induced by the rapid succession of alternate positive and negative currents in receiving by what is known as the "rapid telegraphing system." Also specimens of the irregular wavy line induced by the weak current received through the immensely long circuits of the Atlantic cable.

In the first, the paper is punched by attendants, as many working on different strips as may be required to produce them with sufficient rapidity. The perforated strips of paper, when prepared, are passed with great rapidity between surfaces equipped with springs which will engage and make a contact through the paper at the passage of each hole. There is a limit to the rapidity with which electricity will commence to act, produce the required effect and again cease to act. There is a tendency to "drawl" in its speech, but the difficulty due to that "residual electricity" in a long wire has been largely overcome by sending the current alternately in opposite directions. The holes are in two lines, and distributed so that one line of holes will make positive connections and send positive currents, while the other line alternates between each of the two of the others a negative current, or a current in the opposite direction. There is the same distinction as in the Morse alphabet between dots and dashes. A current being continued longer than another makes a longer mark and distinguishes effectually. The paper is, of course, required to move rapidly in the receiving instrument. By these devices the signals are made to succeed each other at the rate of more than a hundred per second.

By an extra effort on a recent trial, The Rapid Telegraph Company sent, over a single wire, from New York to Boston, fifteen hundred words in a minute.

In the cable messages great rapidity is not attempted. High tension of current is not allowed. The earliest cable was ruined by forcing it with too high charges. It has been and is still a question how to best make appreciable very slight forces.

Prof. Thompson's plan, the earliest used, was to hang a light needle very delicately, as suspending it by a hair, and providing it with a small brightly polished reflector, on which was thrown a ray from a strong lamp. The coil from the table being brought to influence this needle by twisting it alternately in one direction or the other, the fact was measured by the movement of the light spot on the wall produced by the reflection. It has since been found that by combining a number of light needles on a single delicate shaft and enclosing each in a coil so arranged that the current will travel through the whole, and all will conspire to turn the shaft alternately in one direction or the other, sufficient force may be realized to move a fine tube to the right and left. Ink being led into this tube in sufficiently near contact with the paper to receive it the paper is traversed continuously, and the line traced moves towards one edge and the other, alternately, to indicate the required dots and dashes.

Mr. C. H. Hudson called attention to the development by mere practice in telegraphing which may also apply to many other acts. Telegraphing by sound is a marked example. Originally bells were attached to call attention. Young people, particularly females, learn an art like this quicker than

older ones. A class of young telegraphers were soon developed who needed no bells. However much their attention was attracted to other things and their minds preoccupied, while the instrument continued rattling to convey to other stations, the peculiar successions of sounds which indicated their respective offices would arrest the attention of the operator as distinctly as if his or her name was spoken. The practice of telegraphing by sound, and omitting the use of paper in ordinary cases, soon followed.

BOGUS TELEGRAPH MESSAGES.

WILLIAM J. FIPPLE, a telegraph operator, was lately arraigned in the Hudson County (N. J.) Court of Sessions on two indictments. The first charged him with attempting to rob the New York, Lak Erie and Western Railroad Company of \$43,610, and the second charges him with conspiring to defraud the company. He pleaded not guilty, and furnished bail in the sum of \$2,000 for trial. Sipple, it is alleged, was the leader in a bold attempt to steal the amount named, which was in the safe at the Jersey City office. The scheme was defeated through the promptitude of Mr. E. O. Hill, superintendent of the Eastern division. On the night of October 24 a despatch was received over the company's wires to cut off all offices between Paterson and Jersey City, except Bergen Junction. The order bore the initials W. J. H., meaning W. J. Holmes, Superintendent of Telegraph. Supposing that it emanated from Superintendent Holmes the order was obeyed. A few minutes after a despatch was received at Jersey City addressed to Mr. Hill, with the initials B W. S., for Bird W. Spencer, treasurer of the road.

The despatch, which was checked as having been wired from Passaic, advised the superintendent of a gigantic scheme to rob the company arranged by Chief Operator Reed, but timely warning had been received, and Inspector Byrnes, who had been notified, would be on hand to capture the thieves; that Reed had been arrested and had made a full confession. The next despatch, alleging to have been sent by Treasurer Spencer, was that a check for \$50,000 had been filled out by Inspector Byrnes, and that when the check was presented to turn over the money to Detective Boylan, who was then on his way with horse and wagon. Mr. Hill replied: "This mystery has been going on long enough, and not a cent shall leave my possession unless Mr. Spencer comes in person." This was answered by a despatch instructing him to do as directed, which he answered by saying, "The money is safe and no living person shall get a copper of it; we are prepared for any emergency." Finding that Mr. Hill would not allow the money to pass out of his control except to the proper official the scheme was abandoned. The despatches were all sent from the Bergen Junction Station, and Sipple, who was disguised, was identified as the man who had possession of the wires for two hours and forwarded the despatches.

EARTH CONNECTIONS FOR TELEGRAPH WIRES AND LIGHTNING RODS.

When the return current in a telephone or telegraph circuit is carried through the earth it is, of course, necessary to make a very perfect connection between the line and the earth. When it is inconvenient or impossible to make use of water or gas pipes this is accomplished by the use of large plates of copper buried in the earth. Such plates are expensive, and they soon become oxidized so as to be almost insulated. The latter condition takes place still sooner with iron rods or plates.

In the use of strong constant currents, as for ringing bells on railways, &c., disturbances that are attributed to faults in the machinery or the batteries are frequently caused by imperfect earth connections. According to the *Elektrotechnische Zeitung*, Gruener makes use of coke for grounding the current, as well as for the lower end of lightning rods. It possesses the advantage of durability and is comparatively cheap.

A massive block of fine grained coke has a hole bored in it a foot deep, and about 2½ inches in diameter. In it are placed some pieces of pure beeswax, which are melted by means of a blowpipe and alcohol lamp. This is continued until the wax is no longer absorbed into the pores in the walls of the hole. Then the copper wire, one-eighth inch in diameter, which is to serve as line closer, is inserted in the hole. It is made like a clasp at the end and bent upward and then downward. It is now heated by the blowpipe until the wax in the hole is boiling hot, and then carefully driven in until it touches the bottom of the hole. The vacant space around the wire is filled next with lead. Finally the upper edge of the hole receives a coating of hot wax, and over it a second one of tar or asphalt. The durability of the earth connection depends upon carrying out the above details carefully and accurately.

In laying the earth conductor the piece of coke that has been united with the copper wire, as before described, is buried in a hole about 40 inches long and of the same width. Its depth will depend upon the amount of moisture in the earth at that place. It is embedded in fine earth, and a piece of lead pipe or tubing about one-eighth or one quarter inch in diameter is slipped over the wire, its lower end in contact with the piece of coke, and long enough to reach to the surface of the ground. At the upper end a piece of larger pipe, about one or two inches in diameter and three inches long, is put over it, and filled with pitch or asphalt to prevent moisture from penetrating. About twenty-five or thirty pounds of coke, in pieces, is thrown in the hole around the big coke block and packed against it. Over this comes fine earth, on which water is thrown so it will fill up the spaces between the coke and adhere to it. The hole is finally filled with any kind of dirt or earth that has been taken out of it. At the upper end, too, the lead tube and wire is bent downward to prevent the water from entering it. It has been found that such earth connections do good service even in coarse material and tailings without the addition of fine earth.—*Scientific American*.

THE VARIATION IN THE RESISTANCES OF DYNAMOS.

M. LACOLINE recently presented a note to the French Academy of Sciences on this subject. He thinks that the variations in the resistances of magneto and dynamo-electric machines with the increase in their speed is to be explained by the variations in the contact between the movable commutator and the spring brushes. To test this he made a copper cylinder .05 metres diameter, with longitudinal grooves in it, resembling the insulating pieces of a Gramme commutator; two steel springs rubbed on this cylinder from two opposite points, and from each of these lead the wires of a circuit comprising a battery, a telephone and a galvanometer, to measure the resistances. The resistance of the circuit was:

| | |
|--|---------|
| At rest..... | 60 ohms |
| At a speed of 2,000 revolutions.. | 183 " |
| Do to 4,000 revolutions..... | 900 " |
| Do to about 5 000 revolutions.... | 1,567 " |
| At a very high speed, which was not measured from..... | 2,900 " |

The sound given out by the telephone was greater and sharper in proportion to the increase in the speed. At each speed the resistance diminished when the pressure of the springs was increased; in fact, a high enough pressure caused all noise to be suppressed in the telephone. Other experiments with slightly modified apparatus led to the same result. M. Lacoline is of opinion that for a given pressure of the springs the increase in the resistance is proportional to the cube of the speed; but, he adds, "it would be necessary for me to renew these experiments with apparatus which I have not got at Constantinople to be sure of a constant speed and exact measurement. I will conclude by saying that a more intense sound is heard in the telephone when the intensity of the current is not great; from which I conclude that the sound given out by a telephone placed in circuit with a Gramme machine is not caused by the wavelike variations in the current alone, but is also due to the microphonic effect of the commutator."

CURIOUS OCCURRENCE.

A CORRESPONDENT of the London *Times* writes as follows concerning an interesting occurrence at the recent electrical exhibition in Paris: "To-day I had a conversation with a gentleman who was nearly killed the other day by a Brush dynamo-electric machine. Part of the conducting wire was not insulated and was lying on the floor. He touched the stand of a lamp which formed part of the conducting system. His body then formed a connection through the ground to the naked wire, and contracted his muscles so as to cause his hand to clench the lamp. Ten lamps were in circuit at the time, and so much current passed through him that eight of them were extinguished. He was powerless to unclasp his hand. Every muscle in his body was paralyzed. His face was distorted; his lungs were so affected upon that he could scarcely breathe. He could only utter a faint and unnatural cry. The workmen in the place fled from the workshop, believing that some explosion was about to happen. A friend came up and tried to unlock his hand. It was impossible. He then lifted his legs from the ground. This broke the circuit and his hands were released, while burning sparks flew to his hand in the action of breaking the circuit. He was insensible, but has since then greatly recovered, and devised an improvement to the lamp which will prevent a recurrence of such an accident.

THE GALVANIC BATTERY AND SHAMMING.

THE other day a man at Brighton, England, who had been charged with swindling, was unable to be brought before the magistrates owing to his exhibiting symptoms of hydrophobia. He was accordingly sent to the hospital. After examination by the doctor, a galvanic battery was made use of, but without seeming to produce much effect. Upon the doctor remarking, however, that he would obtain a far stronger battery and try that, the man suddenly ceased his barking, and all symptoms of hydrophobia disappeared. He subsequently confessed that he had been shamming, and is now hard at work in prison.

THE address of H. H. Easton, formerly "Lost" Agent Michigan Central R. R., stationed at Jackson Mich., is desired. Information to be wired to Manager W. U. Tel. Co., Jackson Mich., or St. Louis, Mo.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro. Cincinnati, Ohio, for the best illustrated instruction book.

THE "BLOCK" SYSTEM AND SIGNALS ON ENGLISH RAILWAYS.

In a lecture recently delivered before the Society of Arts in London, Prof. Preece gave the following description of the use and value of the "block" system on railways, he said:

"The principle of the 'block' system is simply that a railway is supposed to be divided into certain sections of a given length, and no two trains are allowed, or ought to be allowed, to be in one section at the same time. If, for instance, the section be a tunnel, such as at Canonbury, and two trains are allowed on it, the risk of collision is great, as recently proved. But if the block system be thoroughly and efficiently carried out, there ought to be no such accidents. Some twenty years ago, after a good deal of talking, writing and persuading, I induced the London and South-Western Railway to adopt the block system. The system in use on the London and South-Western Railway is my own. A complete set of apparatus is before you, and I will explain its working. A little semaphore is in front of the instrument, which, when down, indicates that all is clear; and when up, that there is danger, and the train must stop. Suppose the instrument near me is at Waterloo Station, and the other one near Mr. Goldstone is at Vauxhall. That represents a section of the railway upon which we want to allow one train only at a time. To ascertain if all is clear to Vauxhall, I send a warning signal of two beats given twice, indicating 'a train is coming,' which is acknowledged by a signal of one beat from Vauxhall; my semaphore arm is down, telling me that the line is clear, and I let the train go on, sending a signal of two beats [this was done] to Vauxhall, to tell him that the train is in. Vauxhall raises the semaphore behind the train to prevent me from sending on another, and I acknowledge his signal by giving one beat of the bell. The train is now proceeding; the semaphore arm at this end is up, protecting the train, and I cannot, I dare not, send another train until I know that the one now going on has arrived at Vauxhall. It is now supposed to have done so, and he sends three beats upon the bell, which lowers my semaphore arm and tells me: 'Line clear,' and that the apparatus is in working order. On such a system the traffic of a railway can be conducted day by day, and hour by hour, with safety to the public, and with satisfaction and certainty to the railway interest."

ACCURATE TIME-KEEPING.

MANY of the discoveries of science which at the time are regarded merely as refinements—very interesting, but without practical value—sooner or later find their special uses in supplying wants before unfelt. It is but one of the evidences of the advance of civilization that exact methods of dividing and measuring time are now in demand not only by scientists and professional men as formally, but by persons in the most ordinary pursuits of life. To railroad men and watch-makers as a matter of economy, and to individuals as a matter of convenience, it has come to be highly important to know what is the exact time of day to the second, in circumstances where half a century ago it would have quite sufficed to know the minute or even the hour. This may be due to the increased value of time when measured by the number of events or the magnitude of operations which modern ingenuity is capable of crowding into a given interval; there can be no doubt that a second to-day records a greater stride in the world's progress than did any hours in the days of our ancestors. Of so great importance, for many evident reasons, has the knowledge of the exact time

become, that much thought of some of the best heads has been devoted to methods of ascertaining it and making it available by distribution for public use.—From "*Time-Keeping in Paris*," by EDMOND A. ENGELER, in *Popular Science Monthly* for January.

HOW TO STRAIGHTEN WIRE.

A correspondent of the *Blacksmith and Wheelwright* says: To straighten wire take a piece of hard wood plank about a foot and a half long, draw a line lengthwise on the upper side. On the center of this line bore three $\frac{1}{2}$ inch holes; then a little to one side of the line bore two other holes. In each hole drive a hard wood pin, projecting a couple of inches. Now pass the wire from the right and left of these pins and draw it through with a pair of tongs or a hand vice. Oil the wire a little. The plank may stand with the pins horizontal or verticle, as may be desired; held in the vice, nailed to the bench or dovetailed to the wall. Instead of wooden pins quarter-inch iron rod may be used, but if the wire be soft like copper or annealed brass, the iron pins may scratch or mar its surface. The most perfect way to straighten wire when pulled through by hand power is to substitute small rolls for the pins. A groove must be turned in each roll to keep the wire in place. The labor of pulling it through is small compared with the labor of pulling it through the fixed pins. If two of these fixtures be used, one being placed vertical and the other horizontal (if properly made), the wire will be as straight as human hands can make it. As these rolls need be made only 1 inch or $1\frac{1}{2}$ inches in diameter they must be made of rod or steel.

THE TELEPHONE IN A STORM.

A VERY curious experiment was made and announced by M. René Thury, of Geneva. He stretched a metal wire from one roof to another. One extremity of the wire was in connection with a telephone, and the opposite extremity with the earth. During a storm, every time there was a lightning stroke, even at a distance of 20, 30, and even 40 kilometres, the telephone gave a very characteristic sound. This noise, according to M. Thury, was due to the peculiar electric currents, called currents of induction, produced under the influence of the atmospheric electric discharge. It was a sort of return impact.

TELEGRAPH TICKERS—The number of telegraph "tickers" in a city is a pretty good indication of the amount of business transacted in stocks, grain and other articles, the market price of which is reported by these instruments. Thus in New York, the great financial centre of the country, the number of tickers is as follows: Stock 867, general news 126, cotton 86, produce 68, time 82, mining 39. Among the cities having a great number of tickers are the following: Chicago 142, Boston 111, Baltimore 91, Cincinnati 70, St. Louis 69, Buffalo 43, Cleveland 32.

ELECTRO MOTIVE POWER.—The action and reaction of chemical and electrical energy in the store battery of M. Faure, and the action and reaction of mechanical movement and electrical currents in coupled-up dynamo-electrical machines, have conspired together to advance the cause of the electrical transmission of motor power, and to favor the utilization of the vast natural sources of motor energy that are at all times present in blowing winds and in flowing water. Precisely as the store battery is necessary to render the fitful impulses of the capricious wind available for steady and reliable work, so also is it essential for the practical utilization of such periodic recur-

rences as the flowing and ebbing of the tidal currents of the sea. Sir William Thomson appears to have been led to cast a longing and loving eye upon wind-mills on account of the suspicion that it would not answer to construct basins along the coast for generating currents of electricity out of the influx and efflux of the tide, because the land, which might by the same amount of labor be reclaimed from the dominion of the sea, would have a higher money value for agricultural purposes than the water reservoir would have as a source of motive power. It must be remembered, however, that this argument does not at all apply to the various well-known instances in which vast irreclaimable basins are already the dominion of the tide. Thus Prof. Sylvanus Thompson has pointed out that this is essentially the case in the neighborhood of Bristol, where he resides. Nature seems there almost to have taken it in hand to provide beforehand for the working out of the problem. Prof. Thompson states that the construction of only a few yards of embankment would in that instance provide a tidal basin with a rise and fall of 23 feet; and where at the present time power runs to waste every year which would amply suffice, if converted to mechanical account, to charge 10,000,000 of Faure batteries and to raise 20,000,000,000 of pounds one foot high. He calculates that one-tenth part of this power would be quite enough for the permanent lighting of the city of Bristol. He further estimates that a fifth part of the tidal flow which now runs to waste in the channel of the Severn, where the rise and fall are of a still larger amount, would suffice to light every city and to turn every loom, spindle, and axle in Great Britain. It will be thus seen how even the boldness of the idea of utilizing the Falls of Niagara is already on the point of being surpassed by the aspirations of scientific men. If this dream of the application of the tidal pulsations of the sea to the production of mechanical movement through the instrumentality of store batteries and transmitted electrical currents is ever realized, this indeed would be a case of the conservation of energy upon the most stupendous scale; for under such circumstances it would be the majestic roll of the terrestrial globe itself in its inexorable while in space, which would have been harnessed to work the machinery of man. With such a prime dynamo-electrical generator there would assuredly be no limit to the work which might be performed.—*Edinburgh Review*.

PROF. SYLVANUS THOMPSON, in lecturing on the storage of electricity, stated that the two great advances that science had of late made were that the Gramme machine was reversible and the other that a voltaic battery is reversible. The latter was the counterpart and complement of the former, for while the one had solved the problem of the electrical transmission of power, the latter had solved the problem of the electrical storage of energy, but such storage must not be mistaken for the storage of electricity itself.

THE cheapest place to buy pins and brackets appears to be from L. B. Harris, Manchester, N. H. See advertisement and rates in another column.

A NEW kind of wire for overhead telephonic circuits has recently been brought out in the United States by the firm of G. M. Mowbray, of North Adams, Mass.; this wire consists of an insulated core of copper wire (No. 6) sheathed with iron, the two forming a complete metallic circuit. The protective iron sheathing, which envelops the insulated copper conducting wire, and which forms a split tube, overcomes all inductive interference.

LUMINOUS INTENSITY OF THE VOLTAIC ARC.

M. NIAUDET, in his excellent work, *les Machines électriques à courants continus*, gives quite an exhaustive treatise on the voltaic arc; he particularly dwells upon the arc obtained by a continuous current, the positive pole above, and the negative below and on the same vertical line. It is to this case that the following extract has reference.

"Relative luminous intensity of the carbons.—It is very easy to see that the light directed against the lower pole is very much greater than that carried against the top. To see this, it is only necessary to place the two hands, the one above and the other below the arc, and to observe them. The difference is striking.

M. Fontaine has taken a series of photometric measures in a vertical plane, and in all planes varying from the horizontal to the vertical above and below the horizontal plane passing through the arc.

These experiments have proved that the intensity is maximum between 45° and 60° below the horizontal plane, and that it is about ten times greater than the intensity measured at 45° above the horizontal plane. In the same investigation, M. Fontaine has compared the luminous intensities of the voltaic arc furnished by a machine with alternate currents, with those we are now discussing. The same mechanical work was employed in the production of both arcs; the intensity was the same in the horizontal plane; but the mean intensity was much less.

According to M. Fontaine, the mean intensity of the light given by the first arc is three times that given by the second."

THE DIFFERENT MODES OF GENERATING ELECTRICITY.

The most important feature in the electric light system is the generator required for producing a continuous current of electricity, which is worked by steam, water, or gas power. The principal electric generators now in the market are the Brush, Siemens, Edison, Maxim, Weston, Fuller, and Thompson-Houston, all of which are modifications of the electric machine invented as far back as 1842, by a Dutchman named Elias, and re-invented by an Italian named Paccinatti, in 1860, and still later re-invented by a Frenchman named Gramme. The Elias machine together with a book describing it, written by the inventor, and published at Haarlem in 1842, was exhibited at the late electrical exhibition in Paris.

During last year, Mr. Charles E. Ball, of Philadelphia, a prominent inventor, devised and patented a novel electric generator, which is pronounced by prominent electrical experts to be the best thus far invented, and is destined to supersede the Brush, Edison, and other electric light machines now in use. Instead of following the old rut of other electrical inventors and employing an electric armature or series of armatures revolving in one direction near the field magnets, Mr. Ball employs two armatures revolving in opposite directions near the field magnets in such a manner as to require little power, and they produce results which cannot be obtained with the same power by any other generator now in the market. A Ball generator, operated by two half-inch belts, has been in practical operation in New York City for some time past, lighting six arc lamps of very intense power. The same amount of light could only be produced by a Brush, Edison, or other generator, using an eight-inch belt. The Ball generator requires about a half-horse power per arc light, while other generators require from one and a half to two horse power per light.

EDISON'S ELECTRIC METER.

THE system adopted by Mr. Edison for the measurement of the quantity of electricity consumed in each house which receives a supply from one of his mains is as follows: A definite proportion (1-1000th part) of the whole current which goes through the house is shunted through a cell containing two copper plates in a solution of sulphate of copper. The positive plate loses, and the negative plate gains, an amount of copper exactly proportional to the quantity of electricity which passes. There are two such cells in series, one serving as a check upon the other, and the whole arrangement is kept under lock and key, to be opened only by Mr. Edison's agents when they come around to inspect the meters. As the lamps supplied (of a given type) are almost precisely alike in their resistance, and the current, when flowing, is always nearly the same, this arrangement gives a practically accurate measure of the illuminating power supplied.

Tariff Bureau.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, February 15, 1882.

To all offices on Western Union lines:

The following changes which have been made since February 1, 1882, should be entered in the Tariff Book as they will not be republished.

CHANGES.

The old rates (special or otherwise) to offices formerly on the lines of the North Western Telegraph Company should be considered as cancelled by the rates given in the new tariff book. The old rates were obtained by adding the Western Union rate to Milwaukee to the "Other" line rate (as given in the old tariff book) from Milwaukee. A list of former North Western offices may be found in JOURNAL of August 1, 1881.

CALIFORNIA.

* Lafayette, 25 2 (25 1 N.M. rate,) Opelika.

CONNECTICUT.

29 Northford, closed.

DAKOTA.

940 Siding No. 8, changed to 940 Canning.

DELAWARE.

* Delaware Breakwater now * Delaware Breakwater, 25 1 Philadelphia, Pa.

INDIANA.

280 Bradford changed to 280 Monon.

The following, at present "other line offices" on Grand Rapids and Ind. B. R. line, will on and after March 1, 1882, be checked direct at W. Union square and State rates:

| | |
|--------------------|-------------------|
| 261 Avilla. | 261 Lima. |
| 252 Berne. | 242 Lyran. |
| 242 Fountain City. | 261 Rome City. |
| 262 Geneva. | 261 Swans. |
| 261 Hometown. | 261 Wolcottville. |
| 261 La Grange. | |

IOWA.

346 Teeds Grove, Ck. Miles.

KANSAS.

503 Hunts changed to 503 Crawford.

511 Marion Center should read 5.4 Marion.

LOUISIANA.

375 Milneburg, closed.

MARYLAND.

85 Annapolis Junction, 77 Laurel and 85 Relay House are now "other" line offices, 25 2 from Baltimore, Md. or Washington, D. C.

85 Mount Washington, Erase "Ck. Hollins."

84 Newtown Junction, closed.

MICHIGAN.

211 Gault, Lenawee Co., changed to 211 Britton.

240 Leoni, closed.

231 Griffiths changed to 231 North Morenci.

The following, at present "other" line offices, on Grand Rapids and Ind. B. R. line, will on and after March 1, 1882, be checked direct at W. Union square and State rates:

| | |
|-------------------------------|---------------------|
| 137 Ashton. | 260 Martin. |
| 100 Beitner's. | 261 Mendon. |
| 260 Belmont. | 260 Monteith. |
| 260 Bradley. | 260 Morley. |
| 1 0 Boyne Falls. | 260 Paris. |
| 137 Cadillac. | 127 Petoskey. |
| 260 Cedar Springs. | 260 Pierson. |
| 100 Fife Lake. | 260 Rockford. |
| 127 Harbor Springs. | 260 Rosa. |
| 100 Kalkaska. | 260 Sand Lake. |
| 100 Kingsley, G'd Trav'se Co. | 100 South Boardman. |
| 177 Leroy, Osceola Co. | 260 Starwood. |
| 260 Lockwood. | 137 Tustin. |
| 100 Mancelona. | 100 Walton. |
| 187 Manton. | 260 Wayand. |

MINNESOTA.

893 Fairfield, P. O. Lakeville.

Norwood, Plato and Young America will hereafter be in square 865.

MONTANA.

* Deer Lodge now 50 5 Butte City, Mon., or 50 2 Bismark Dak., "Fraser 25 1 Helena."

NEW JERSEY.

41 bit ts, closed.

NEW YORK.

Bullville, Circleville, Pine Bush and Thompson's Ridge will hereafter be checked direct at W. U. square and State rates. All are in square 46.

46 Shawangunk, changed to 46 Wallkill.

NORTH CAROLINA.

* Edenton, 50 3 (40 2 N.M. rate) Norfolk, Va.

* Hertford, 50 3 (30 2 N.M. rate) Norfolk, Va.

116 Laurinburg and 116 Shoe Heel now in square 125.

OHIO.

* Deerfield, now * Deerfield 25 2 Bracerville.

180 Glenville changed to 180 Fair Grounds.

* Hocking port close 1.

* Little Hocking 25 2 Chillicothe or Marietta. Erase "15 1 by telephone, Parkersburg, W. Va."

* Long Bottom closed.

281 Mill Creek changed to 281 Alfordston.

* * Newton Falls now * Newton Falls, 25 2 Bracerville.

* * Palmyra now * Palmyra, 25 2 Bracerville.

170 Pasco, closed.

* Portland, Meigs, Co. closed.

PENNSYLVANIA.

67 Centerville, York Co., ck. Airville.

78 Chickies. Erase Ck. Watts.

94 Fayetteville, closed.

130 Irvineton P. O. Irvine.

QUEBEC.

The State rate to Stanstead will hereafter be the same as the State rate to Vermont.

TEXAS.

* Belton (N.M.) 40 3 Austin. Erase "40 3 Round Rock."

* Collins 30 2 Corpus Christi.

* Gatesville (N.M.) 65 4 Austin. Erase "65 4 Round Rock."

VIRGINIA.

153 Williamson's changed to 153 Clifton Forge.

WISCONSIN.

850 Greenfield changed to 850 Tunnel City.

Lake Mills reopened as W. U. office, square 325.

ATLANTIC CABLE.

On and after March 1, 1882, the ten letter limit will apply to the "place to" or destination, in all messages to South America.

CUBA CABLE.

The notice in the last JOURNAL under Cuba Cable referring to figures in plain and code messages applies only to places beyond Havana.

We are notified that the cable between St. Thomas and St. Kitts was repaired Sept. 8, 1881. The Dominica and Guadeloupe and the Antigua and Guadeloupe cables are interrupted, cutting off Guadeloupe. Messages will be forwarded by best means during interruption.

ATLANTIC CABLE.

Until further notice the use of code or cipher is forbidden in private messages exchanged with or passing through Delmaria or the Herzegovina.

The cables between Hong Kong and Amoy and between Amoy and Shanghai are interrupted cutting off Amoy.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in three columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

| | | |
|-------------|----------------|----------------|
| 285 Bangor. | 293 Falkville. | 324 Prichards. |
| 294 Calera. | 297 Notasulga. | 266 Stock Mill |
| 323 Epes. | | |

- * Ft. Morgan, 75 5 Mobile.
- * Gainesville, 25 2 Epes.
- * Point Clear, 50 3 Mobile.

ARIZONA.

| | | |
|--------------------|-------------------|---------------|
| 639 Bowie Station. | 660 Canon Diablo. | 669 Holbrook. |
| 669 Winslow. | | |

ARKANSAS.

| | | |
|----------------|------------------|----------------|
| 445 Brentwood. | 391 Jacksonport. | 449 West Fork. |
|----------------|------------------|----------------|

CALIFORNIA.

| | | |
|---------------------|-------------------|------------------|
| 827 Albion Mills. | 800 Ocean View. | 826 Table Bluff. |
| 800 Decoto. | 720 San Geronimo. | 847 Whitesboro. |
| 799 Norman Station. | | |

- * Midwell's Bridge, 25 2 by telephone, Greenville.
- * Lafayette, 15 2 by telephone, Martinez.
- * Whitniet Creek, 15 2 by telephone, Martinez.

COLORADO.

| | | |
|-----------------------|------------------|-------------------|
| 546 Agate. | 541 First View. | 545 Orchard. |
| 565 Boreas. | 545 Godfrey. | 557 Red Cliff. |
| 623 Browns Canon. | 545 Hardin. | 634 Rockwood. |
| 540 Buffalo, Weld Co. | 590 Holleys. | 628 Sargents. |
| 628 Calumet. | 599 Hortense. | 598 South Pueblo. |
| 562 Carr. | 623 Hot Springs. | Ok. Pueblo. |
| 545 Deuel. | 634 Ignacio. | 592 Timpas. |
| 559 Earle. | 540 Liff. | |

- * Rock Springs, 65 4 Plattsmouth, Neb.

CONNECTICUT.

25 Hop River.

- * Bridgewater, 20 0 by telephone, New Milford.
- * Naubac, 30 3 Hartford.
- * Noroton, 10 0 by telephone, Stamford.
- * Warren, 20 0 by telephone, New Milford.
- * Whitneyville, 50 0 New Haven.
- * Winnipauk, 10 0 by telephone, Norwalk.

DAKOTA.

| | | |
|---------------------|----------------|-----------------|
| 886 Big Stone City. | 890 Hillaboro. | 925 Miller. |
| 940 Canning. | 926 Hitchcock. | 895 Montrose. |
| 915 Chamberlain. | 947 Houston. | 920 Northville. |
| 947 Dickinson. | 896 Kindred. | 915 Ordway. |
| 938 Eagles Nest. | 895 Mayville. | 903 Preston. |
| 913 Eldridge. | | |

- * Crook City, 50 2 by telephone, Deadwood.
- * Pine Ridge Agency, 150 9 Cheyenne Wy.
- * Rosebud Agency, 175 10 Cheyenne Wy.
- * Spear Fish, 50 2 by telephone, Deadwood.
- * Sturgis City, 50 2 by telephone, Deadwood.

FLORIDA.

- * Blue Pond, 75 5, (50 3 N. M. rate) Lake City.
- * Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
- * Highland, 50 4 Lake City.
- * Paola, (N. M.) 100 6 Lake City.
- * Perry Junction, 75 5, (50 3 N. M. rate) Lake City.
- * Tocoi, (N. M.) 50 3, Lake City.
- * Waits Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

| | |
|---------------------|-------------------|
| 307 Dubois. | 187 Folkston. |
| 245 East Point. | 186 Perkins Junc. |
| | |
| * Abbeville (N. M.) | 40 3 Ft. Gaines. |
| * Arlington, 40 3 | Ft. Gaines. |
| * Blakely, 40 3 | Ft. Gaines. |
| * Senola, (N. M.), | 25 2 Newnan. |

IDAHO.

| | | |
|---------------------|---------------|---------------|
| 578 Arimo. | 970 Dry Lake. | 970 Rathdrum. |
| 970 Coeallala Lake. | | |

ILLINOIS.

| | | |
|-------------------|---------------------|---------------------|
| 300 Allendale. | 337 Breckenridge. | 309 Montrose, King- |
| 307 Alpine. | 307 Dumper. | ham Co. |
| 316 Annawan. | 345 Forreston Junc. | 347 Oakford. |
| 323 Beecher City. | 318 Gays. | 337 Rockville. |
| Elmhurst Co. | 316 Lanark Junc. | 318 Stockton. |
| 329 Belknap. | 307 Mannheim. | 346 Union Grove. |
| 298 Bonfield. | | |

INDIANA.

| | | |
|-------------------|-------------------|-----------------|
| 252 Briant. | 253 Letts Corner. | 300 Owensville. |
| 300 Cythiana. | 298 Lowell. | 290 Paxton. |
| 280 English Lake. | 282 Milroy. | 271 Sedalia. |
| 300 Ingles. | 280 Monon. | 263 Westport. |

- * Ferdinand. By mail, Ferdinand Station.
- * Elkhart, free, by telephone, Dana.
- * St. Meinrad. By mail, Ferdinand Station.

IOWA.

| | | |
|-----------------------|-------------------|--------------------------|
| 426 Angus. | 425 Irvington. | 345 Riggs, Ok. Pres- |
| 345 Browns, Ok. Pres- | 416 Kamrar- | ton. |
| 367 Buffalo. | 454 Irwin. | 425 Rutland. |
| 425 Dakota City. | 445 Kirkman. | 473 Salix. |
| 367 Donahue, Ok. | 388 La Croy. | Ok. 367 Sand Spring, Ok. |
| Dixon. | Hamill. | Anamosa. |
| 367 Fairport. | 435 Lake City. | 416 Thor. |
| 435 Farnhamville. | 407 Laurel. | 407 Van Oleva. |
| 418 Galt. | 397 Libertyville. | 417 Van Wert. |
| 407 Girard. | 435 Lohrville. | 367 Viola, Ok. Stone |
| 425 Hardy. | 367 Montpelier. | City. |
| 416 Harcourt. | 455 North Boro. | 425 West Bend. |
| 426 Herndon. | 415 Pilot Mound. | 425 Willow Glen. |
| | 417 Polo. | |

KANSAS.

| | | |
|-----------------|---------------|---------------------|
| 517 Alum Creek. | 503 Crawford. | 527 Lenora. |
| 455 Argentine. | 527 Edmond. | 448 Mulberry Grove. |
| 466 Barclay. | 514 Galva. | 518 Valley Center. |
| 527 Cleveland. | 506 Haselton. | 475 Wakarusa. |
| 517 Clifton. | 508 Horton. | 466 Westphalia. |
| 527 Collyer. | | |

- * Cottonwood Falls, 50 0 Cottonwood.
- * Enterprise, 15 0, by telephone, Detroit.

KENTUCKY.

| | |
|---|-------------------|
| 263 Bloomfield. | 263 Finchville. |
| 263 Crescent Hill. | 263 Taylorsville. |
| | |
| * Clay Lick, 25 1 by telephone, Worthville. | |
| * Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Hunting- | |
| ton, W. Va. | |
| * Eastern Junc., 50 3 Lexington, Ky., or 35 2 Hunting- | |
| ton, W. Va. | |
| * Flemingsburg, 15 2 by telephone, Johnson Junc. | |
| * Gistville, 25 1 by telephone, Worthville. | |
| * Gratz, 25 1 by telephone, Worthville. | |
| * Lockport, 25 1 by telephone, Worthville. | |
| * Marion, 15 1 by telephone, Worthville. | |
| * Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, | |
| W. Va. | |
| * Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. | |
| Va. | |
| * Port Riffe, 25 1 by telephone, Worthville. | |
| * Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va. | |
| * Springport, 20 1 by telephone, Worthville. | |

LOUISIANA.

| | |
|--|--------------------|
| 424 Eola. | 442 Pleasant Hill. |
| 424 Garland. | 433 Provencal. |
| 442 Grand Cane. | 433 Bobeline. |
| 354 Lookout. | 442 San Patrice. |
| 434 Mermonteau. | 442 Stonewall. |
| 383 Mounds Sta. | 424 Whitesville. |
| | |
| * Millikens Bend (N. M.), 40 3 Tallulah. | |
| * Plaquemine, 50 3 New Orleans. | |
| * St. James, 50 3 New Orleans. | |
| * Vacherie, 50 3 New Orleans. | |

MAINE.

4 Presque Isle.

MARYLAND.

| | | |
|-----------------|-------------------|------------------|
| 85 Ashland. | 77 Marlboro. | 54 Pocomoke Sta- |
| 77 Bowie. | 67 Octorara. | tion Ok. Poko- |
| 67 Edgewood. | 85 Odenton. | moke City. |
| 85 Lutherville. | 54 Pocomoke Junc. | |

MASSACHUSETTS.

| | | |
|--|---------------------|--------------------|
| 36 Conway. | 21 Wellesley Hills. | 12 W. Harwich, Ok. |
| | | Dennisport. |
| | | |
| * Bass River Harbor, 05 0 by telephone, So. Dennis. | | |
| * Cochesett, 25 0 by telephone, East Bridgewater. | | |
| * Collins' Mills, Dracut, 15 1 by telephone, Lowell. | | |
| * Dracut Navy Yard, 15 1 by telephone, Lowell. | | |
| * Forge Village, 15 1 by telephone, Lowell. | | |
| * Graniteville, 15 1 by telephone, Lowell. | | |
| * Hyannisport, 15 0 by telephone, Hyannis. | | |
| * Lunenburg, 10 0 by telephone, Fitchburg. | | |
| * Mattfeld, 50 0 East Bridgewater. | | |
| * Melrose Highlands, 25 0 Melrose. | | |
| * Middlesex Village, 15 1 by telephone, Lowell. | | |
| * Phenix Village, Tewksbury, 15 1 by telephone, Lowell. | | |
| * South Billerica, 15 1 by telephone, Lowell. | | |
| * South Mills, 10 0 by telephone, New Bedford. | | |
| * Weentham, 35 0 by telephone, Providence, R. I. | | |
| * West Bridgewater, 15 0 by telephone, East Bridgewater. | | |
| * W. Chelmsford, 15 1 by telephone, Lowell. | | |
| * Westford, 25 0, Westford Depot. | | |
| * Westford Depot, 15 1 by telephone, Lowell. | | |

MEXICO.

- * Paso del Norte, 05 0 El Paso, Tex.

MICHIGAN.

| | | |
|---------------------|--------------------|--------------------|
| 138 Beaver Lake. | 119 Free Soil. | 127 Mullet Lake. |
| 220 Beech. | 137 Hobart. | 281 North Morenci. |
| 251 Bridge-water. | 127 Indian River. | 269 Shelbyville. |
| 211 Britton. | 251 Jerome. | 127 Topinabee. |
| 210 Brockway Centre | 119 Manistee Junc. | 127 Vanderbilt. |
| 250 Orapo. | 210 Marietta. | 100 Wezell. |
| 210 Fostoria. | 210 Mayville. | 127 Wolverine. |
| 127 Freedom. | 260 Moline. | |

MINNESOTA.

| | | |
|-------------------|--------------------|-----------------------|
| 190 Argyle. | 861 Minnehaha. | 869 Rock Island Quar- |
| 845 Arlington. | 865 Minnetonka. | ry. |
| 875 Buffalo Lake. | 867 Mission Creek. | 876 Vernon Centre. |
| 865 Hamburg. | 890 Muskoda. | 865 Waconia. |
| 889 Kennedy. | 870 Omaha. | 865 Winthrop. |

- * Currie, 25 2 Tracy.

MISSISSIPPI.

| | |
|---------------------------------|-------------|
| 261 Courtland. | 263 Morton. |
| | |
| * Aroola, 85 6 Vicksburg. | |
| * Johnsonville, 85 6 Vicksburg. | |
| * Stoneville, 85 6 Vicksburg. | |

MISSOURI.

| | | |
|------------------------------|-----------------|----------------------|
| 457 Ellis. | 428 Montserrat. | 898 Shelbyville, Ok. |
| 369 Eliah. | | Shelbina |
| | | |
| * Augusta, By mail, Labadie. | | |
| * Purdin, 25 2 Unionville. | | |

MONTANA.

| | | |
|-----------------|--------------|----------------------|
| 957 Iron Butte. | 583 Melrose. | 583 Silver Bow Junc. |
| 956 Keith. | | |

NEBRASKA.

| | | |
|---------------------|-------------------|----------------|
| 927 Atkinson. | 464 Gilmore. | 923 Long Pine. |
| 538 Chappell. | | |
| | | |
| * Benkeman, (N. M.) | 60 4 Plattsmouth. | |
| * Burchard, (N. M.) | 35 2 Plattsmouth. | |
| * Liberty, (N. M.), | 35 2 Plattsmouth. | |

NEW BRUNSWICK.

| | |
|--------------------------------|---------------|
| 3 Albert. | 3 Lake Ha Ha. |
| 3 Carleton Sta. | 3 St. Louis. |
| | |
| * Port Elgin, 25 2, Sackville. | |

NEVADA.

| | |
|-------------|-------------------|
| 676 Luning. | 676 Soda Springs. |
|-------------|-------------------|

NEW HAMPSHIRE.

| | |
|--|--|
| 20 Livermore. | |
| * Chesterfield, 25 0 by telephone, Brattleboro, Vt. | |
| * Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt. | |
| * North Hinsdale, 20 0 by telephone, Brattleboro, Vt. | |

NEW JERSEY.

| | | |
|------------------|----------------------|--------------|
| 41 Brick Church. | 41 Centerville, Pas- | 47 Magnolia. |
| Tariff same as | sale Co. | 52 Valley. |
| Orange. | 47 Oremont. | 41 Wayne. |
| 53 Cedar Brook. | | |

NEW MEXICO.

| | | |
|----------------|-------------|------------------|
| 566 Cerrillos. | 633 Lays. | 630 San Antonio. |
| 637 Coolidge. | 632 Monero. | 636 Upham. |
| 637 Gallup. | | |

- * Fort Stanton, 25 2 San Marcial.

NEW YORK.

| | | |
|-------------------------|----------------------|--------------------|
| 64 Albion Station. | 51 Fish's Eddy, Del- | 74 Scriba. |
| Cowage Co. Ok. | aware Co. | 44 Trambly's Iron |
| Sand Bank. | 64 Mannville. | Works. |
| 65 Apalachin. | 83 Nichols. | 65 Vestal. |
| 46 Cornwall on Hud- | 83 North Lansing. | 46 Walkhill. |
| son. | 51 Rockland. | 46 Wisconsin Junc. |
| | | |
| * Minisink, Orange Co., | 15 1 Fort Jervis. | |

NORTH CAROLINA.

| | | |
|--|------------------|-------------|
| 205 Alexanders. | 125 Laurel Hill. | 173 Newton. |
| | | |
| * Falkland, 25 2 (25 1 N. M. rate), Tarboro. | | |
| * Pictolus, 40 3 (30 2 N. M. rate), Tarboro. | | |

NOVA SCOTIA.

| | |
|--------------------------------|---------------|
| 2 Albion Mines. | 2 Sherbrooke. |
| | |
| * Baddeck, 25 1 North Sydney. | |
| * Ingonish, 25 1 North Sydney. | |

OHIO.

| | | |
|--|-----------------------|----------------------|
| 221 Alvada. | 180 Fair Grounds. | 232 Osgood Sta. |
| 231 Alvordston. | 202 Hadley Junction. | 252 St. Johns. |
| 170 Barton. | 221 Luckey. | 159 Strasburg, Stark |
| 151 Brilliant. | 221 McComb. | Co. |
| 180 Creston. | 221 McQuire. | 213 Wheelersburg. |
| 180 Everett, Summit | 180 New Berlin, Stark | |
| Co. | | |
| | | |
| * De Kalb, 25 2 Mansfield. | | |
| * Hartsville, 15 1, Minerva. | | |
| * Hayville, Ashland Co., 15 1 by telephone, Ashland. | | |
| * Middle Branch, 15 1, Minerva. | | |
| * Mogadore, 15 1, Minerva. | | |
| * Monroe Centre, 20 1, No. Kingsville. | | |
| * New Hazelton, 15 1, Minerva. | | |
| * North Benton, 25 2 Braceville. | | |
| * Osnaburg, 15 1, Minerva. | | |
| * Pierpont, 25 2 No. Kingsville. | | |
| * Poland, free by telephone, Youngstown. | | |
| * Robertsville, 15 1, Minerva. | | |
| * Sherrodsville, 15 1, Minerva. | | |

OREGON.

| | |
|--|-------------|
| 795 Beaverton. | 795 Whites. |
| 785 Cascade Incline. | |
| | |
| * Airlee (N. M.), 50 3, Portland. | |
| * Blue Mountain, 50 5 by telephone, Walla Walla, W. T. | |
| * Fort Klamath, 50 3, Ashland. | |
| * Linkville, 50 3, Ashland. | |
| * Milton, 50 5 by telephone, Walla Walla, W. T. | |
| * Weston, 50 5 by telephone, Walla Walla, W. T. | |

PENNSYLVANIA.

| | | |
|---|-----------------------|----------------------|
| 140 Corsico. | 181 June Bug. | 130 Thompsons, War- |
| 52 Cresco, Monroe | 64 Lewistown Junc. | ren Co. |
| Co. | 140 Lucinda Station, | 59 Virginsville, Ch. |
| | | Moselem. |
| 192 Elk Lick. | 84 Mainville. | |
| 151 Ekna, Allegheny | 84 Mountain Grove. | 140 Volant. |
| Co. | 140 Nesbannock Falls | 151 Wilkinsburg. |
| | | |
| 140 Evansburg, But- | 58 Rowland's. | 151 Willow Grove, |
| ler Co. | 58 Snydertown | Allegheny Co. |
| 151 Fallston. | 111 Soughbird. | 140 Wilmington. |
| 84 Georgetown. | 140 S. & A. Junction. | 140 Zellanaple. |
| 59 Honey Brook. | 181 Stcnerville. | |
| | | |
| * Academy Corners, 15 1 by telephone, Lawrenceville | | |
| * Alms House, 10 1 Allentown. | | |
| * Balliettsville, 10 1 Allentown. | | |
| * Best Sta., 10 1 Allentown. | | |
| * Centre Point, 10 1 Allentown. | | |
| * Churchville Berks Co., 10 1 Allentown. | | |

- * Clayton, 10 1 Allentown.
- * Corning, 10 1 Allentown.
- * Cowanesque Valley, 20 1 by telephone, Lawrenceville.
- * Dillingersville, 10 1 Allentown.
- * Elmer, 20 1 by telephone, Lawrenceville.
- * Eagleville, 10 1 Allentown.
- * Fairview, Montgomery Co., 10 1 Allentown.
- * Fagleyville, 10 1 Allentown.
- * Franklin, Lehigh Co., 10 1 Allentown.
- * Gihbertsville, 10 1 Allentown.
- * Harrison Valley, 20 1 by telephone, Lawrenceville.
- * Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.
- * Ironton, 10 1 Allentown.
- * Limerick Square, 10 1 Allentown.
- * Lower Miford, 10 1 Allentown.
- * Neffs, 10 1 Allentown.
- * Neshaminy, 10 1 by telephone, Lawrenceville.
- * New Berlin, 10 1 Allentown.
- * Pleasant Corner, 10 1 Allentown.
- * Red Hill, 10 1 Allentown.
- * Richaville, 10 1 Allentown.
- * Saeger'sville, 10 1 Allentown.
- * Schnecksville, 10 1 Allentown.
- * Statesdale, 10 1 Allentown.
- * Trappe, 10 1 Allentown.
- * Yellow House, 10 1 Allentown.
- * Zionville Sta., 10 1 Allentown.

QUEBEC.

Beauce June.
Bulwer.
Entia.Hulet's Landing.
St. Alphonse de la Grand
Bois.

SOUTH CAROLINA.

146 Jacksonboro.

146 Ravenets.

TENNESSEE.

292 Bellevue.

292 White Bluffs.

340 Witha.

183 Union Depot.

316 Whitesburg.

TEXAS.

652 Albany.

498 Otero (South).

657 Sierra Blanca (So.).

651 Alexander.

460 Forest.

648 Trinity Mills.

656 Antelope (South), 664 Lafan (South).

470 Wayne.

479 Bagwells.

470 Lodi.

500 West.

657 Boracho (South), 655 Metz (South).

657 Wildhorse (South).

652 Bremen.

489 Margaret.

483 Winona.

657 Cariso Pass (So.), 656 San Martin (So.), 459 Wharton.

456 Clear Creek.

* Aguilera, 50 3 Corpus Christi.

* Benavides, 40 3 Corpus Christi.

* Counts, 35 2 Beaumont.

* Los Angeles, 50 3 Corpus Christi.

* Pena, 40 3 Corpus Christi.

* Realitos, 40 3 Corpus Christi.

* Salado, 40 3, Anasin.

* San Diego, 40 3 Corpus Christi.

* Village, 40 2 Beaumont.

VERMONT.

27 Miles Pond.

Ok. St.

31 Pompanoosuc.

Johnsbury.

39 South Wallingford.

27 Passumpsic.

* E. Rupert, 15 2 Factory Point.

* Guilford, 10 0 by telephone, Brattleboro.

* Hartwellville, 20 1 by telephone, No. Adams, Mass.

* Jacksonville, 25 2 by telephone, No. Adams, Mass.

* North Stamford, 15 1 by telephone, No. Adams, Mass.

* Readsboro, 20 1 by telephone, No. Adams, Mass.

* Readsboro Falls, 20 1 by telephone, No. Adams, Mass.

* Readsboro, 25 2 by telephone, No. Adams, Mass.

* Stamford, 15 1 by telephone, No. Adams, Mass.

* Wells, 15 2 Factory Point.

* West Dover, 25 0 by telephone, Brattleboro.

* Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

188 Clifton Forge.

162 New River Depot.

153 Roanoke.

* Lairds, (N. M.), 40 3 Richmond.

* New Market, Nelson Co., (N. M.), 25 2 Richmond.

* Salisbury, (N. M.), 40 3 Richmond.

WASHINGTON TERRITORY.

784 Carbonado.

722 So. Texas.

774 Skagit City.

784 White River.

WEST VIRGINIA.

* Coalmont, (N. M.), 30 2 Greenbrier, W. S. Spgs. or 45 3

Huntington.

* Talcott, (N. M.), 25 2 Greenbrier, W. S. Spgs. or 50 3 Hun-

tington.

WISCONSIN.

345 Barneveld.

325 Jefferson June.

325 Sullivan.

306 Calhoun.

356 Livingston.

352 Superior June.

325 Cottage Grove.

325 Loudon.

339 Summit Lake.

306 Dousman.

306 No Greenfield.

350 Tunnel City.

382 Haywood.

347 Rudolph.

354 Turtle Lake.

339 Kampeter.

306 Spring Meadow.

306 Wales.

WYOMING.

573 Fossil.

NORVIN GREEN.

President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, Feb. 14, 1882.

To all Transfer Agents and offices.

The transfer service has been temporarily discon-
tinued at Bowling Green, Ky., and Bismarck, D. T.

NORVIN GREEN,

President.

APPLICATION OF FAURE'S ACCUMULATOR

At Vienna two engineers are said to be engaged in fitting up works for producing immense quantities of electricity by the hydraulic power of the Danube. The electricity is stored up, in accordance with Faure's method of accumulation, in boxes of various sizes, and supplied to manufacturers and tradesmen for the purpose of lighting and working machinery by electricity. Despite the immense cost of the plant and the very low price at which the fluid is to be sold to the public, the inventors expect to derive an immense profit for their work, and therefore to find capital to back them up to any extent. Besides storing electricity in boxes, it is intended to convey it by cables sunk in the ground. By a combination of methods, storehouses of electricity are to be established in each district at Vienna, so that manufacturers, shopkeepers, sewing machine workers, etc., need but just take their boxes to the depot to have them filled with electricity in one or more days, according to the circumstances of the case. At the central works it is intended to make an immense shaft transmit the hydraulic power of the river to the shore, and there to produce the desired speed by means of multiple transmissions. To guard the hydraulic machinery from the effects of frost and ice, the gigantic shaft is to be let down considerably below the level of the river; by this means the ice is prevented from touching the circumference of the water wheel, even in the severest frost of winter. It is further contemplated to provide immense ice breakers, to prevent the injurious effects of drifting ice.

Feb. 7th.—A telegram from London of this date announces that the balance of the cable for the Central and South American Telegraph Company is all on board the *Silvertown*, and she is expected to sail in about a week.

Messrs. Theophilus Smith, W. F. O'Brien and J. Rippon, gentlemen in the service of the India Rubber, Gutta Percha and Telegraph Works Company (Limited), of Silvertown, England, arrived per Royal Mail steamer *Don*. They are accompanied by seven cable hands, who with the gentlemen named above, have been employed on board the steamship *International*, which has just successfully laid the Vera Cruz Goatzacoalos section of the cable for the Central and South American Telegraph Company. The party have left for Payta to join the steamship *Dacia*, which will lay the sections from Oborillos to Payta, and from Payta to Santa Elena in Ecuador. The *Dacia* arrived at Rio de Janeiro December 19, was at Valparaiso January 11, where she would remain one day, and should now be at Callao awaiting the report of surveys in progress by the *Retriever*, under direction of Mr. E. A. Patrone.

The *International*, carrying the section which has been laid from Vera Cruz, south, arrived at that port December 17, and immediately commenced operations. Fifty miles of deep sea cable had been laid some months before, some miles of which had to be raised, and the course slightly diverted to suit more recent surveys.

The whole section was then laid, 129 1 2 miles in all, which was satisfactorily accomplished on the 2d ult. The section was turned over to the company, and accepted by its engineer after 5 days of continuous testing. The work was somewhat seriously delayed by northers on the coast, and by occasionally rainy and foggy days. The work was performed under the direction of Mr. Theophilus Smith, Engineer-in-Chief. Mr. O'Brien is the Secretary of the expedition, and Mr. Rippon is Electrician.

The land line across the Isthmus of Tehuantepec to connect the Gulf sections with the Pacific, has been commenced, and will be ready as soon as required. Mr. E. R. Mayo, formerly on the Brazos and Brownsville Texas Railroad, is Engineer in charge. Several months will see the completion of the important work, and cable communication established all along the vast length of the American Continent.—*The Panama Star and Herald*.

Mr. F. W. Jones, who has been for some time past General Circuit Manager of the W. U. Tel. Co., has resigned his position there and accepted the office of Vice President and Manager of the Union Electric Manufacturing Co., in Bond St. N. Y. city. His many friends will be glad to hear of his increased prosperity and success.

The application of water power to the generating of electricity for lighting purposes has been successfully carried out in the town of Godalming, Surrey, England, this being the first time in which such motor has been applied in that country. The electric light is to be employed in all the streets and public buildings of the town, a small incandescent light being used in the lanes and byways.

Paraffine Oils and Wax,

Prepared especially

FOR ELECTRICAL PURPOSES,

Without Acids or Alkali.

STEVENSON, BRO. & CO.,

No. 132 So. Second St., Philadelphia, Pa.

THE CHEAPEST PLACE TO BUY

PINS & BRACKETS,

In the world is from

L. B. HARRIS,

MANCHESTER, N. H.

Prices for 1,000 or less, F. O. B., as follows:

| | |
|----------------------------------|-----------------------|
| Plain Oak Brackets..... | \$15.00 per thousand. |
| Painted " " " " " " | 17 00 " " |
| Plain " Pins..... | 12.50 " " |
| Painted " " " " " " | 13 00 " " |
| Spools for Magnets, all sizes .. | 45.00 " " |

Special prices for large quantities and samples furnished on application to

L. B. HARRIS,

Manchester, N. H.

THE

BROOK'S PATENT INSULATORS

WERE AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1887
At the Vienna Exposition, 1873
At the Cincinnati Industrial Exposition in 1874.
And at the Centennial Exposition at Philadelphia in 1876.

MANUFACTURED AND FOR SALE BY

DAVID BROOKS,

21 North 21st Street, Philadelphia.

Operators' Cramps cured by

LITTLE GIANT
FRENCH BATTERY
Relieves Rheumatism
and all Nervous Com-
plaints. Supersedes all
others. Send for circular.
C. E. JONES & BRO.
Cincinnati, Ohio.

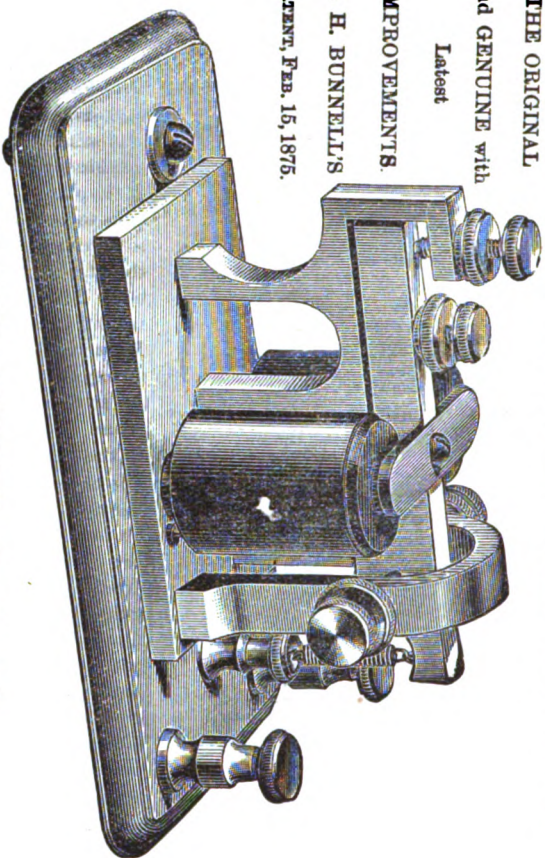
J. H. BUNNELL & CO.'S FIRST CLASS TELEGRAPH MACHINERY.

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS.

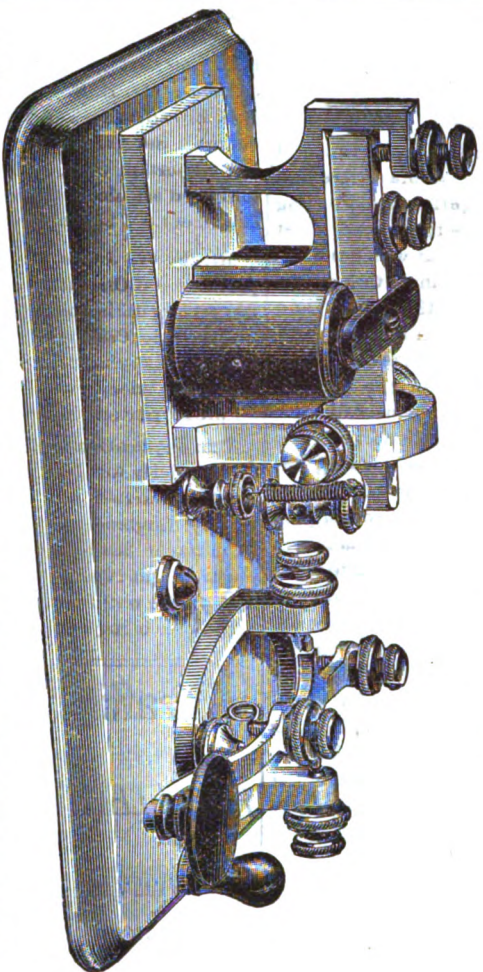
J. H. BUNNELL'S

PATENT, FEB. 15, 1875.



THE GIANT SOUNDER—UNEQUALLED!

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$5.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



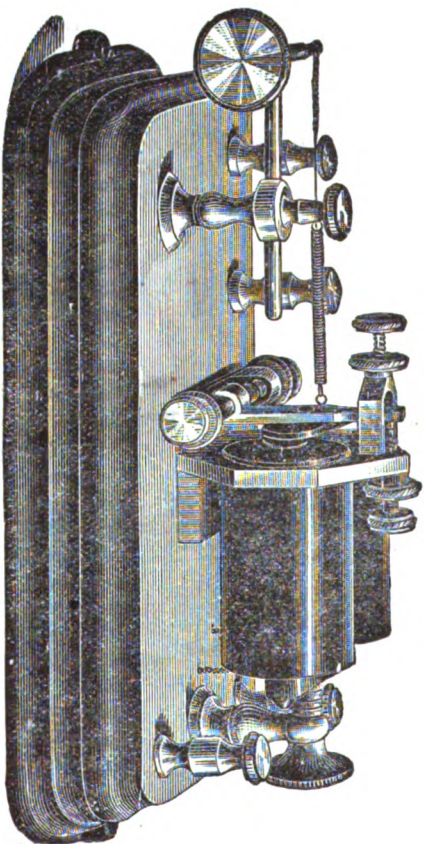
GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET:

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$8.00, carefully boxed and sent by mail, prepaid, to any part of the United States.

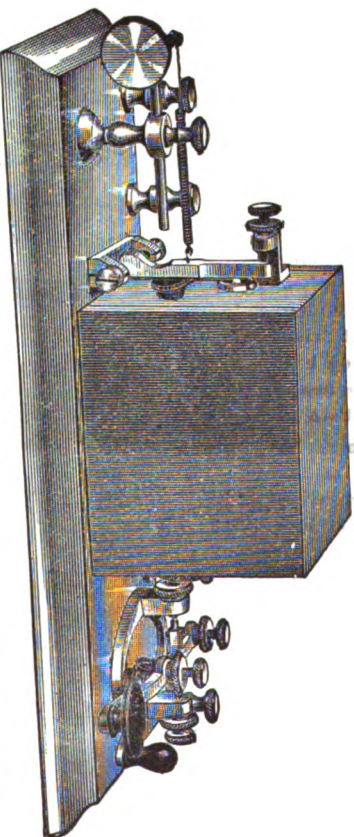
All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.



FIRST-CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

160 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Surbase, Extension Adjustment. Price, \$8.50.



BOX SOUNDING RELAY AND STEEL LEVER KEY.

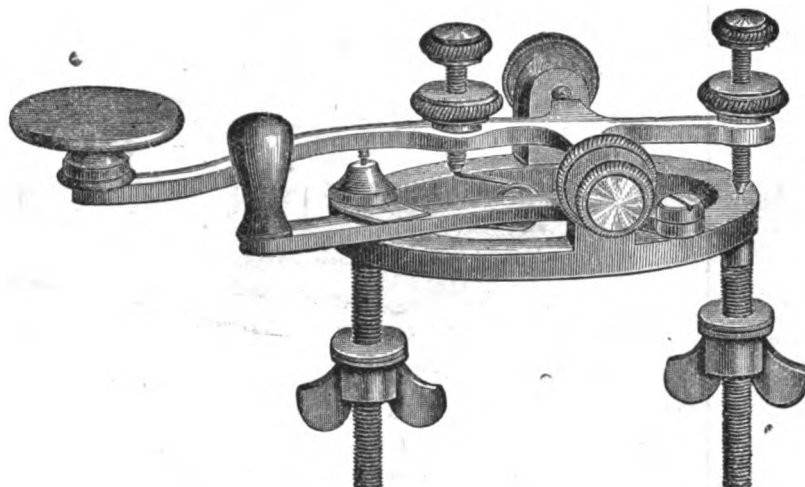
COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$12.00; without Key, \$9.00.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:


The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

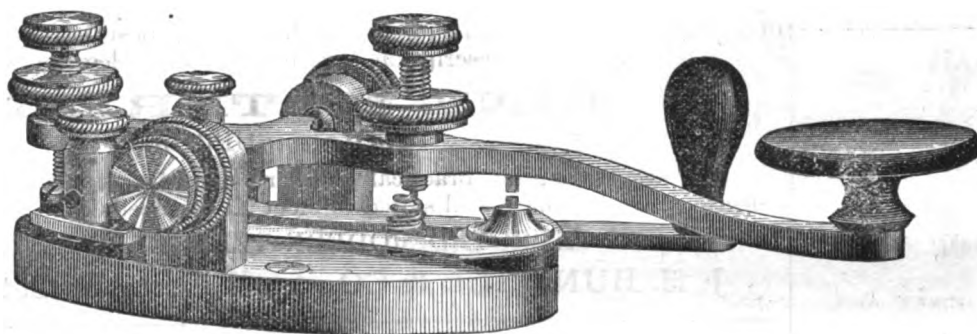
The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Legless Pattern Steel Lever Key.



A BEAUTIFUL AND PERFECT KEY,

Suitable for Use on Fine Desks, or Wherever a Legless Key is Preferable.

PRICE, Carefully boxed, and sent, prepaid, by mail to any part of the United States, **\$4.00.**

J. H. BUNNELL & CO., 112 LIBERTY STREET, NEW YORK.

CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.Magneto Crank and Push Button Call Bells, Electric Bells,
District Bells and Switches for Exchanges, Annunciators, etc.**TELEGRAPH & ELECTRICAL INSTRUMENTS.**

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

Geo. WENTINGHOUSE, Jr., Pres. RAUFEL BAGLEY, V. Pres. & Treas.

O. H. JACKSON, Gen'l Manager. ASAPH T. HOWARD, Secretary.

HENRY SWYDER, General Agent.

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
Sole Owners and Manufacturers of the only practically suc-
cessful**SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.**Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Elec-
tricity.Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnish-
ed upon application.

ESTABLISHED 1880.

ALFRED F. MOORE,

[SUCCESSOR OF JOSEPH MOORE & SONS]

MANUFACTURER OF

INSULATED TELEGRAPH WIRES.

200 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

INSULATING AND OFFICE WIRES. FLEXIBLE CORDS. ANNUNCIATORS

AND BELL ALARM WIRES. RESISTOR CABLES.

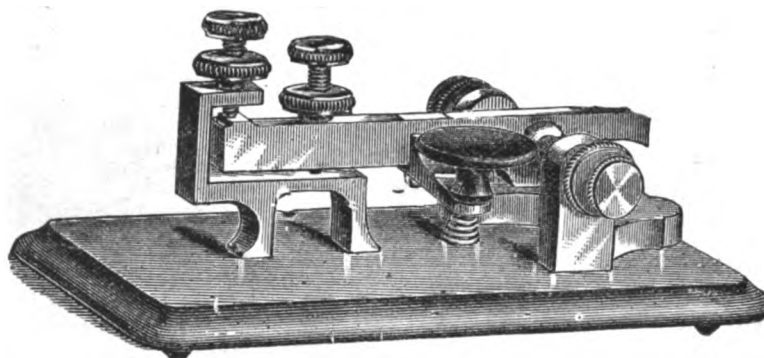
All wire used is thoroughly tested for conductivity, therefor
ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP

FOR FLEXIBLE CORDS

Descriptive Circulars furnished upon application.

NEW MECHANICAL**TELEGRAPH INSTRUMENT.**
PATENT APPLIED FOR.**COMBINED KEY AND SOUNDER.****NO BATTERY REQUIRED.**

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is *always ready for use.*Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or register-
ed letter.**J. H. BUNNELL & CO.,**

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S**NEW, LARGE,****ILLUSTRATED CATALOGUES****OF NOVEMBER, 1881?**

If not, send your address by postal card or letter and you will get one by return mail

IT CONTAINS

Illustrations, descriptions, and the

BOTTOM PRICESof all things Telegraphic, including the latest and best designs of Telegraph Instru-
ments of every description, together with all Telegraph and Telephone**LINE MATERIALS.****TOOLS & SUPPLIES.**We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of**IMPROVED MODERN TELEGRAPH SERVICE.****J. H. BUNNELL & CO., 112 Liberty Street, New York.****Don't Read This,** or you will be sure and send for our
new 1882 Catalogue which is
proper and to your interest to do before purchasing elsewhere. If you want to be-
come a Telegraph Operator send twenty-five cents for our new 1882
Illustrated Instruction Book. It is the most complete instruction book
published in the world.**C. E. JONES & BRO.,**

Manufacturers and Dealers in Telegraph, Telephone and Electrical Supplies.

51 WEST FOURTH STREET, CINCINNATI, OHIO.

WESTERN ELECTRIC MANUFACTURING COMPANY.

220-222 KINGS STREET, CHICAGO.

62-68 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES,

Insulated Copper Wire, Electric Bells and Annunciators, Burglar Alarms the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Fan and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, St-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

AMSON SEAGNER, President, HENRY M. BARTON, V.-Pres.

EMMA GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE. |
|---|--------|--------|
| I—Complete Set of Catalogues..... | 206 | 20c. |
| II—Telegraph Instruments and Supplies..... | 64 | 6c. |
| IV—Insulated Wire (included in II). | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 22 | 2c. |
| VI—Electro-Medical Apparatus..... | 22 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 22 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 2c. |
| XI—Magnets for Mills..... | 20 | 2c. |
| See Wm. Thomson's Nautical Instruments... | 24 | 6c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,

AND

PLAIN AND OILED WIRE OF SUPERIOR QUALITY,

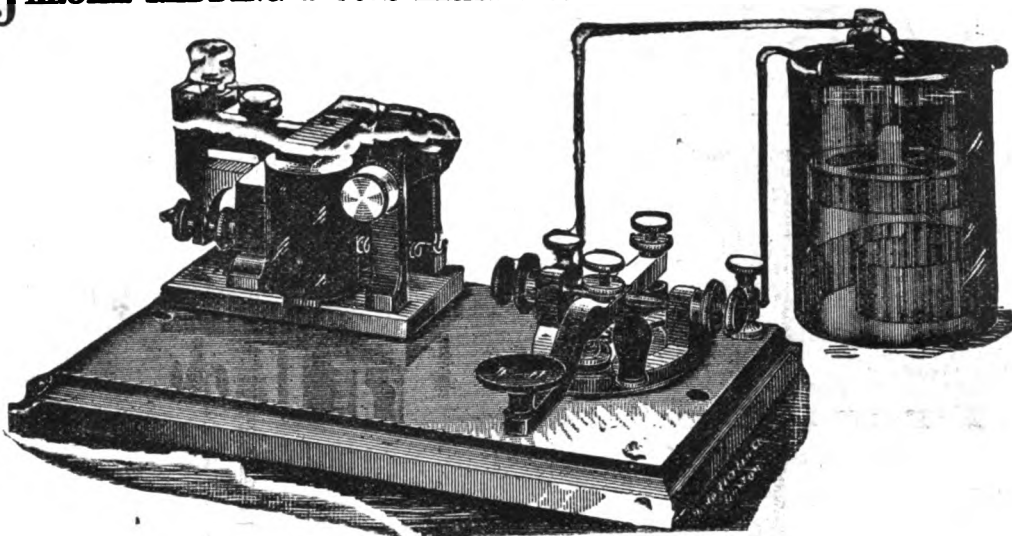
FROM SWEDISH CHARCOAL AND B B IRON.

BUT ONE JOINT PER MILE.

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



PRICE FOR THE COMPLETE "GEM" LEARNERS' OUTFIT, \$4.20.

Consisting of the above large-sized Sounder and Key, a good Cell of Calland Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument made that has nicely finished brass Sounder and Key Levers with perfect adjustments for both.*

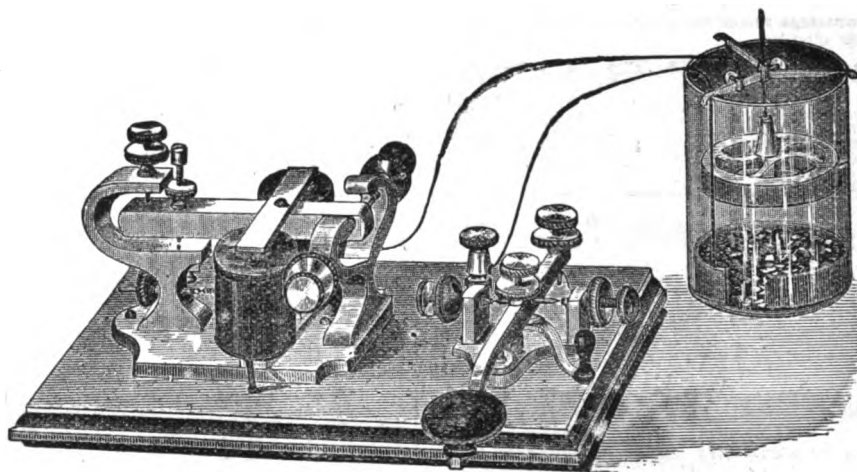
| | | | |
|---|--------|---|--------|
| Price for Complete Outfit..... | \$4.20 | Price for Instrument alone, (1) 1 to 15 miles.. | \$4.00 |
| " " Instrument alone | 3.40 | " " " " " " | " " |
| " " Instrument alone, by mail, postpaid ... | 4.00 | by mail, postpaid..... | 4.80 |

SEND FOR CIRCULAR.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,

No. 80 HANOVER STREET, BOSTON, MASS.



No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of Sounder, Key, either on 1 base or separate, 5x7, Calland Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent O. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

A. B. LYMAN, 36 South Water St., Cleveland, O.

PARTRICK & CARTER

TELEGRAPHIC SPECIALTIES.

THE GIANT SOUNDER PERFECTED.

Patented Feb. 16, 1875. Most perfect, reliable, clear toned; fine finish, and warranted the best working sounder in existence. Price, by mail, \$5.00.

THE "LATTIG" AUXILIARY LEVER NON-STICKING KEY.

PATENTED AUGUST 16, 1881. PRICE, \$5.00, BY MAIL.

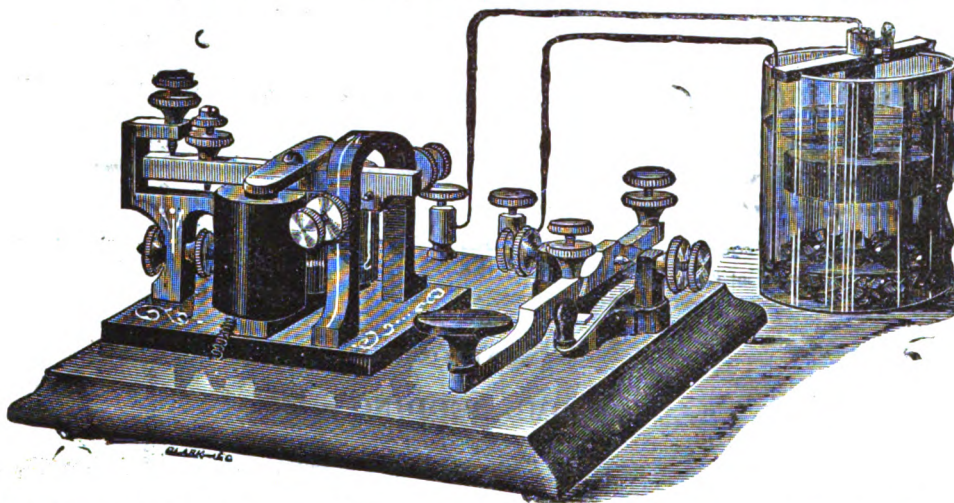
This Key is very fine finish nickel-plated, and presents a beautiful appearance, is easy to handle and WARRANTED NEVER TO STICK. It has been extensively tried and has received the endorsement of the best operators in the country. It embodies the only true principle to prevent a Key from sticking by having a great separation between the anvil and hammer, (without increasing the play of the Key lever), thereby preventing the formation of the "Electrical Arc" between the platinum points, which is the PRIMARY CAUSE of STICKING KEYS. We claim this Key will never fail to make contact.

"THE EXCELSIOR KEY." (PATENT APPLIED FOR.) PRICE \$2.50 BY MAIL.

This Key is made ENTIRELY OF BRASS NICKEL PLATED, with hardened platinum points, and it is put forward to meet the long existing demand for a CHEAP, LIGHT, EASY WORKING, FIRST CLASS KEY, and is without doubt the CHEAPEST and BEST KEY EVER OFFERED FOR THE MONEY.

Premium Learners' Apparatus.

Only \$5.00. Not the Cheapest, but Guaranteed the Best.



The PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER, PERFECTED," and "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Oslaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5.00, when the money accompanies the order. The great number of these Instruments use is the best testimonial that can be offered.

Price, Complete Outfit Money in advance, \$5.00
 " Instrument without Battery " " 4.20
 " Instrument without Battery, by Mail " " 4.75
 Remittances should be made by P. O. Money Order, Registered Letter, Draft or Express, which will insure safe delivery.
 Send for circulars.

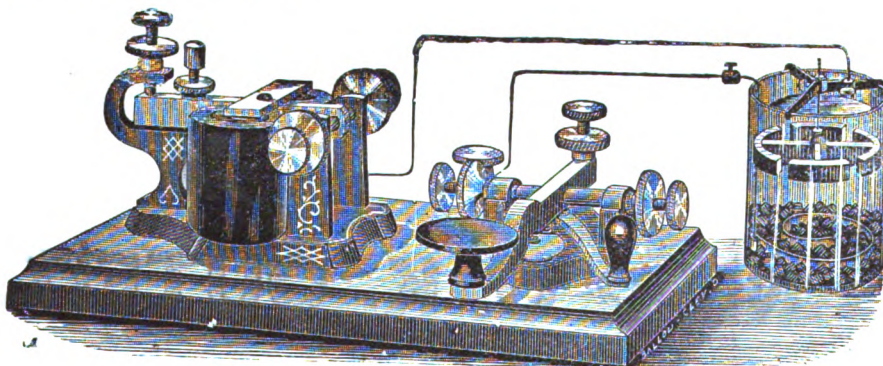
PARTRICK & CARTER,

No. 114 SOUTH SECOND STREET, PHILADELPHIA, PA.,

Manufacturers and Dealers in TELEGRAPH, TELEPHONE, AND ELECTRICAL INSTRUMENTS AND SUPPLIES OF EVERY DESCRIPTION. Send for Catalogues and Circulars.

SEND FOR OUR PRICES BEFORE PURCHASING ELSEWHERE.

EUREKA OUTFIT NO. 2.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

THE ABOVE OUTFIT AND MATERIAL ALL COMPLETE SENT ON RECEIPT OF \$4.25.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

Room 19, Leader Building, Cleveland,

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

2,164 MEMBERS.

\$21,640 RESERVE FUND.

The Association respectfully invites attention to its success during the past ten years, having paid to its beneficiaries over \$175,000, and accumulated a reserve fund of \$21,640, interest upon which nearly pays current annual expenses. No officer or agent draws salary or commission. Average annual assessments to each member has been less than \$13.

Any person, of either sex, in good health of not less than 18 or more than 45 years of age, who is employed in telegraphic service, and is otherwise qualified as required by the By-Laws, is eligible to membership; and should a member in good standing leave the telegraphic service, but continue to pay all dues assessed and otherwise conform to the Constitution and By-Laws, he can retain his membership.

The initiation fee is \$2. \$1,000 will be paid to the beneficiary of a deceased member within 60 days after verification of claim; and in the case of a member who has been one year, next preceding date of death—in good standing the claim is indisputable.

Any one who is or becomes a member in good standing of this Association is also eligible to membership in the new or Second Division. For further information, copies of Constitution and By-Laws, blank applications, etc., apply to any of the following named officers or agents:

OFFICERS:

CLARENCE UARY, President. O. H. SUMMER, Vice-President.
 A. B. BREWER, Secretary. SAMUEL M. TAYLOR, Treasurer.

EXECUTIVE COMMITTEE:

CLARENCE UARY, New York. O. H. SUMMER, Chicago, Ill.
 A. B. BREWER, New York. SAMUEL M. TAYLOR, New York.
 W. H. YOUNG, Washington, D. C. F. W. JONES, New York.
 JOHN E. ZEUBLIN, Phil. Pa. CHARLES S. H. SMALL, New York.
 JAMES MERRIHEW, New York.

AUDITING COMMITTEE

H. C. ROBINSON, Philadelphia, Pa. T. P. SOULLE, New York.
 R. W. POPE, New York.

AGENTS:

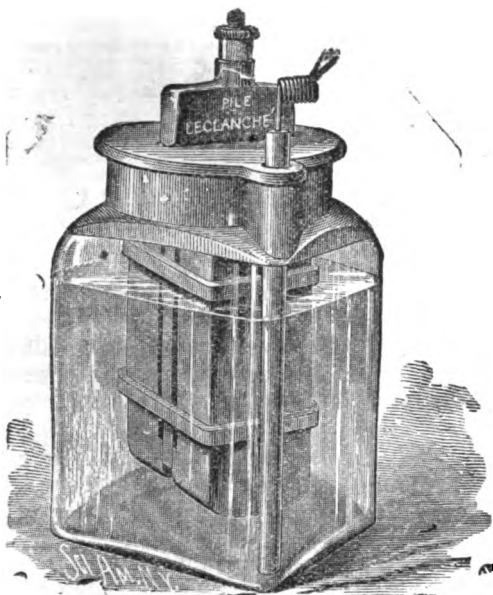
| | |
|---|---------------------|
| Albany, N. Y. | Charles G. King. |
| Augusta, Ga. | John W. Brown. |
| Atlanta, Ga. | J. M. Stephens. |
| Baltimore, Md. | R. J. Bloxham. |
| Bangor, Me. | H. C. Bliss. |
| Bismarck, Dak. | E. C. Greene. |
| Boston, Mass. | J. W. Tillingham. |
| Buffalo, N. Y. | Chas. F. Annett. |
| Cheyenne, W. Ter. | G. W. Sheppard. |
| Cincinnati, Ohio. | Charles H. Skelton. |
| Chattanooga, Tenn. | J. D. Easterlin. |
| Charleston, S. C. | J. Uhrig. |
| Chicago, Ill. | H. L. Melton. |
| Cleveland, Ohio. | C. W. Ross. |
| Columbus, Ohio. | W. B. Rundle. |
| Denver, Col. | F. I. Benson. |
| Dubuque, Iowa. | T. W. Hill. |
| Detroit, Mich. | E. P. Wilcox. |
| Elkhart, Ind. | N. M. Booth. |
| Evansville, Ind. | E. D. Benedict. |
| Grand Rapids, Mich. | David Hall. |
| Galveston, Texas. | A. T. Oline. |
| Grafton, W. Va. | H. A. Clute. |
| Harrisburg, Pa. | Alex. E. Hoyt. |
| Halifax, N. S. | S. B. Curtis. |
| Hartford, Conn. | F. A. Moore. |
| Indianapolis, Ind. | D. S. Fleming. |
| Jackson, Mich. | Nelson E. Jacobs. |
| Jackson, Tenn. | M. D. Wood. |
| Kansas City, Mo. | H. E. Doolittle. |
| La Fayette, Ind. | E. O. Newton. |
| Little Rock, Ark. | Charles Smith. |
| Louisville, Ky. | B. P. Shreve. |
| Mobile, Ala. | E. Winter. |
| Montgomery, Ala. | O. Reilly. |
| Memphis, Tenn. | D. H. Henshaw. |
| Milwaukee, Wis. | James Kent. |
| Montreal, Quebec. | A. H. Stewart. |
| Nashville, Tenn. | J. M. Fairchild. |
| New Haven, Conn. | J. T. Alley. |
| New Orleans, La. | Nath'l Martell. |
| No. Sydney, C. B. | G. W. Russell. |
| New London, Conn. | C. D. Reed. |
| N. Y., L. Erie & W. R.R. (21 Cortlandt St. N. Y.) | Frank Ross. |
| Oil City, Pa. | L. M. Rheem. |
| Omaha, Neb. | Wm. G. Jones. |
| Philadelphia, Pa. | G. H. Grace. |
| Phillipsburgh, N. J. | J. E. Ranney. |
| Peoria, Ill. | C. L. Le Baron. |
| Pensacola, Fla. | J. E. Palmer. |
| Pittsburgh, Pa. | S. K. Ruple. |
| Poughkeepsie, N. Y. | C. D. Livermore. |
| Portland, Me. | D. F. Leahy. |
| Portland, Oregon. | Edgar M. Dexter. |
| Providence, R. I. | W. H. Runyon. |
| Reading, Pa. | W. C. Walstrum. |
| Richmond, Va. | A. J. Stoddard. |
| Rochester, N. Y. | Frank Bell. |
| Reno, Nevada. | H. H. Hamilton. |
| Sayre, Pa. | R. O'Brien. |
| Scranton, Pa. | Luther G. Field. |
| Syracuse, N. Y. | B. T. Olmch. |
| St. John, N. B. | W. H. Stanton. |
| St. Louis, Mo. | Day E. Smith. |
| St. Paul, Minn. | A. P. Dubois. |
| San Francisco, Cal. | H. Griffith. |
| Savannah, Ga. | W. J. Denver. |
| Springfield, Mass. | W. W. Kelchne. |
| Springfield, Ill. | J. Lanskall. |
| Toronto, Ont. | F. D. Adams. |
| Troy, N. Y. | J. P. Church. |
| Toledo, Ohio. | Perry Hood. |
| Vincennes, Ind. | W. H. Young. |
| Washington, D. C. | Jno. G. Tomlinson. |
| Wheeling, W. Va. | G. W. Gates. |
| White River Junction, Vt. | P. Bruner. |
| Wellsville, Ohio. | E. W. Bradford. |
| Worcester, Mass. | D. Van Nostrand. |
| Watertown, N. Y. | |

A. B. BREWER, Sec'y.

P. O. Box 3175.

New York.

W. U. T. Building, Room 52.

LECLANCHE BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company,
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones.

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Pilaques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of IMITATIONS and WORKMANSHIP.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity
Sine and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,

40 West 18th St., New York.

Or L. G. TILLOTSON & CO.,

5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FURNISH

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BUGLE ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLES, ETC.

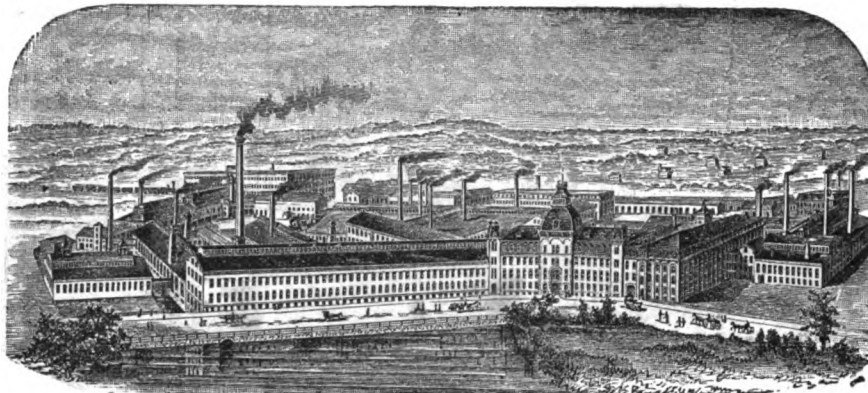
OFFICE AND FACTORY: 67 STEWART STREET,

(PROVIDENCE, R. I.)

W. H. SAWYER, Electrician and Sup't.

TELEGRAPH WIRE.**WASHBURN & MOEN MANUFACTURING COMPANY.**

ESTABLISHED 1871. CAPITAL \$1,800,000.

**WORCESTER, MASS.**

21 OLIVE STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequalled in that particular.
Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

(In connection with the DOUBLE SHEET FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.
Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.
N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

KERITE INSULATED**TELEGRAPH WIRES AND CABLES**

KERITE IS INDESTRUCTIBLE.

FIVE YEARS OF THE EXPERIMENT TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

in earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession

THE

DURABLE QUALITIES OF KERITE

RECOMMENDED IN AS THE

CHEAPEST AND MOST ECONOMICAL

insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation furnished at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

B. HITCHCOCK, General Agent.

TELEPHONE WIRE.**THE AMERICAN BELL TELEPHONE COMPANY.**

W. H. FORBES, President, W. K. DRIVER, Treasurer,

THEO. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Atlantic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

The "Morse" Learners' Instrument.

THE BEST.

THE "MORSE"

Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

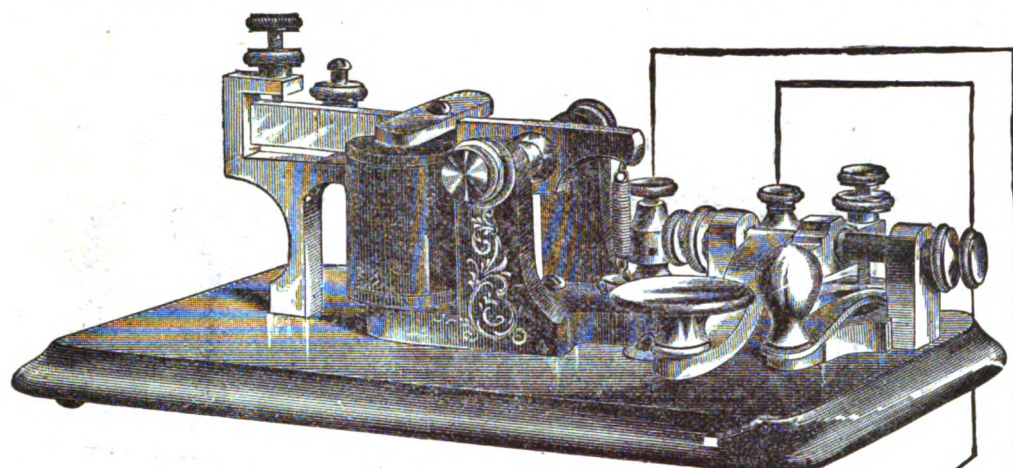
It is the best working set of Learners' Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

You are **SURE** of getting
THE BEST THAT IS MADE

IF YOU SELECT THE "MORSE."

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.



THE BEST.

Price, \$450, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.

"Morse" instrument alone, without battery..... \$3.80

"Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 4.50

Cell of battery complete..... .65

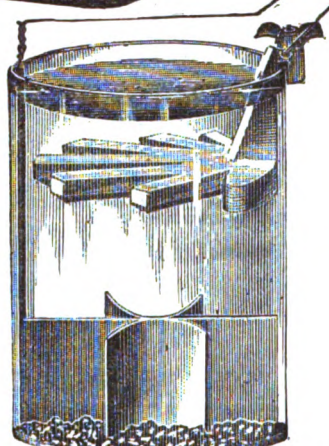
"Morse" Learners' Instrument, without battery, sent by mail..... 4.30

(Battery cannot be sent by mail.)

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.



YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "73," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 either designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents;

also Embellished Keys 25 for 25 cents. Samples of Operators' Cards 10 cents. 50 New and laughable Illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 20c. 25 side-spitting Comic Cards, 2c. Morocco card cases, two pockets, 10c. 100 finely printed letter heads, \$1.00. 100 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.50, samples, 10c. Agents Wanted to take orders for the finest and largest stock of B-vel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also sat n fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and el pper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200, no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in g-l and silver, finely illustrated, for \$1.00, will sell quick, from 3 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,

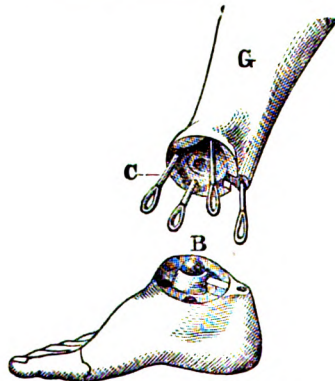
F. P. MUNN, CLYDE, Wayne Co., N. Y.

WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, December 14, 1881.
DIVIDEND No. 58.

The Board of Directors have declared a quarterly dividend of ONE AND ONE-HALF PER CENT. upon the capital stock of this company from the net revenues of the three months ending December 31st, instant, payable at the office of the Treasurer on and after the 16th day of January next to shareholders of record on the 20th day of December, instant.

The transfer books will be closed at three o'clock on the afternoon of the 20th of December, instant, and re-opened on the morning of the 17th of January next.

B. L. JONES & CO., Treasurer.



THE CELEBRATED-BLY

ARTIFICIAL LIMBS.
With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.
GEO. E. FULLER,
Successor to Dr. D. BLY, Rochester, N. Y.

BEST TELEPHONE EXCHANGE SWITCH BOARD.

IN THE WORLD.

SUPERSEDING ALL OTHERS.

Sample and Circulars sent to Exchanges on
Application to

C. E. JONES & BRO.,

CINCINNATI, OHIO.

WESTERN SCHOOL OF TELEGRAPHY.

JANESVILLE, WISCONSIN.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement, now of eight years standing, with the system of city lines in Chicago known as the Metropolitan Telegraph Company, having over 100 offices, and worked in connection with the Western Union Telegraph Company. These city lines draw their operators from this school, placing them first in sending offices and afterwards promoting them according to merit. The superintendents of telegraph of the different railroads centering at Chicago, employ many men from the city lines, and the Western Union Company does the same, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make of our students first class operators, nor to obtain for them first class situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

RICHARD VALENTINE, } MANAGER.
A. M. VALENTINE, }

N. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have lately furnished the following Companies in this way: Wisconsin Central, Green Bay & Minn.; St. Paul, Minneapolis & Chicago; St. Paul, M. & Omaha and Burlington & N. W. Western.

We can so furnish, on short notice, experienced operators competent to manage any ordinary office, and reliable in every respect.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, MARCH 1, 1882.

WHOLE NO. 344

MAGNETIC DISTURBANCES, AURORAS, AND EARTH CURRENTS.*

BY PROF. W. GYLLS ADAMS, F. R. S.

THE object of establishing a magnetic observatory is to determine at any instant the direction and magnitude of the earth's magnetic force. The direction of the magnetic force of the earth is the direction in which a small magnetic needle would point when it is freely suspended, so as to turn about an axis passing through its center of gravity. But it is not easy to suspend a magnetic needle so as to turn freely and yet to be sure that the axis about which it turns passes accurately through the center of gravity of the needle, and if it does not so pass, then on suspending the needle we have not only the magnetic force, but also the gravitating force of the earth acting upon it to turn it about its axis, and the position which it takes up shows us the direction of these combined forces upon the magnetic needle.

This direction depends upon the mass of the needle, for to that its weight is due; it depends upon the form of the needle and the position of its center of gravity with regard to the axis on which it is hung; it depends also on the magnetic properties of the substance, so that it is not easy to determine even the direction of the magnetic force by a plan which theoretically is so very simple. Instead of attempting to make the required determinations by such a method it is necessary that a steadier mode of suspension should be adopted, and that may be done as soon as it is discovered in what vertical plane the force of gravity, combined with the earth's magnetic force, will cause such a needle to rest. This is usually done by loading a steel needle at one end and then magnetizing it with its poles so arranged that the extra weight of the heavier end shall balance the downward pull of the magnetic force on the other end. In this case the needle when magnetized will remain at rest in a horizontal direction, when suspended on a point on which it can turn freely in a horizontal plane.

A magnetic needle suspended in this way has been called a declination needle. Such a needle is employed in the mariner's compass, in our galvanometers for measuring currents of electricity, and in magnetic observatories for determining the declination, or what is sometimes called the variation of the magnetic needle. This needle determines the position of the vertical plane in which lies the direction of the earth's magnetic force; this is called the plane of the magnetic meridian. The plane of the magnetic meridian is usually different from the vertical plane through the north and south poles, which is called the geographical meridian, and the angle between these two planes is the declination or variation of the magnetic needle.

If such a magnetic needle as I have just described

be supported on horizontal knife edges instead of being supported on a point, the needle when magnetized may remain at rest balanced in a horizontal direction, one end being pulled downward by the earth's vertical magnetic force, and the other by the force of gravity. Any change in the intensity of the vertical magnetic force of the earth will be shown by an up or down motion of the marked end of the needle. Such an instrument, called a balance magnetometer, is specially adapted for showing any changes in the vertical magnetic force of the earth, and the changes or disturbances of the earth's vertical magnetic force are determined by means of such a balance magnetometer. We have, then, our declination or variation needle to determine the vertical plane, called the magnetic meridian, and we have our balance magnetometer to determine any changes which may take place in the vertical magnetic force of the earth.

By the declination needle we can not only determine the plane of the magnetic needle, but by making the needle oscillate to and fro horizontally and counting the number of oscillations in a given time we can determine the horizontal pull upon the poles of the needle, i. e., the intensity of the earth's horizontal magnetic force upon the needle, just as by the swing of a simple pendulum in a vertical plane under the action of the force of gravity we can determine the pull of the force of gravity upon the bob of the pendulum. By a similar method and by a properly suspended needle either the vertical force or the total magnetic force of the earth may be determined.

In order then to determine the direction of the earth's magnetic force we may make use of a declination needle to give us the vertical plane, and place the dipping needle in such a position that it will oscillate in that plane; when it comes to rest it will point in the direction of the total magnetic force, i. e., in the direction through the room of Faraday's lines of magnetic force.

In order to determine the magnitude of that force the horizontal force may be found by finding the number of oscillations of the declination needle in the way that I have already explained, and these three determinations will give us the direction and magnitude of the earth's total magnetic force.

Another method of making the required determinations is to take a coil of copper wire, which is wound on a circular frame in such a way as to be capable of spinning on a diameter of the circular frame.

Faraday showed that on turning such a coil in a magnetic field a current of electricity is induced in the coil, and the strength of this current is proportional to the number of lines of force cut by the coil. We may describe such an arrangement as a magneto-electric machine, in which the magnet employed is the earth itself.

By means of this instrument we may determine either the horizontal or the vertical magnetic force

of the earth. By placing the axis vertical and spinning the coil at a given rate we may determine the horizontal force, and by placing the axis horizontal in the magnetic meridian and spinning the coil at the same rate we may determine the vertical force, the currents produced in the two cases being in the same ratio as the numbers of the lines of force cut in the two positions.

The greater the angle at which the axis of rotation is inclined to the direction of the lines of force the greater will be the number of them included in the revolving circle, and the greater the induced current produced in the coil.

Thus placing the axis in different positions we get currents of different strengths, and may readily see that we get the greatest current when the axis is at right angles to the direction of the lines of force, i. e., to the line of the dip.

We may further make use of such a coil to find the direction of the lines of force, for if we place the axis parallel to the lines of force, the currents in opposite halves of the coil will balance one another, because each line of force is cut twice by the coil, and so no current is produced in the external circuit through the galvanometer.

If then we place the coil so as to get no current when we rotate it, then the direction of the axis of the coil is the direction of the dipping needle, i. e., of the magnetic lines of force.

We will suppose, now, that for some point of time, say June 1st at 12 o'clock, midday, the three magnetic elements, i. e., the declination, the horizontal force, and the vertical force, have been determined, we have now to consider the changes or disturbances produced in these magnetic elements, and the connection of these changes with other phenomena, and especially the connection between auroras, earth currents, and the larger and more irregular magnetic disturbances.

I have already drawn attention to the declination needle and the balance magnetometer for measuring the changes of declination and of the vertical force.

For measurement of the changes in the horizontal force a special instrument is employed, called a bifilar magnetometer, in which a magnet is suspended by two threads, which are so placed that by their torsion acting against the magnetic force of the earth, the magnet is kept at rest in a horizontal position in a direction at right angles to the magnetic meridian.

This completes the list of instruments for our magnetic observatory.

Any change or disturbance of the horizontal force pulls this magnet round more or less in the horizontal plane, and its change of position is observed as in the other instruments. The results I have to bring before you this evening have been derived from the photographic registrations of similar instruments in different parts of the world, so that the motion of the needle has recorded its own tale

* Lecture delivered at the Royal Institution, June 3, 1881.—*Nature*.

on the prepared paper which is wrapped on a cylinder driven by clockwork, and so placed as to receive the spot of light reflected by the moving needle.

First, there are regular daily and yearly changes, showing that the sun produces regular changes in the three magnetic elements which depend on the time of the day and the season of the year, so that the change of position and apparent motion of the sun with respect to the place of observation produce regular magnetic changes. These regular daily changes are accompanied by and have very generally been supposed to be due to electric currents or electric waves traversing the earth's crust, and a discussion by Dr. Lloyd of the observations made by Mr. Barlow in 1847 of currents on telegraph wires showed a very close relationship between the two-hourly changes of the declination needle and the changes of intensity and direction of earth currents on telegraph lines.

Both Dr. Lamont and Dr. Lloyd conclude, from their comparisons of earth currents and magnetic changes, that the changes of the declination needle cannot be due to the direct action of the electric current traversing the earth's crust, but that these currents or waves, extending to a considerable depth, alter by induction the magnetism of the earth itself, and this change of magnetism causes the observed changes in the declination needle. Thus the magnetic changes are the indirect effects of (not the earth current in its immediate neighborhood, but of) a change in the magnetism of the earth itself, which may be due to an electric wave extending over a considerable area of the earth's surface.

The point toward which the total earth current is directed follows the sun and seems to lag two or three hours behind, but not the same distance behind at different places.

These earth currents have been ascribed to different causes: thus Dr. Lamont regards them as the results of electric force emanating from the sun; De Saussure regards them as developed by evaporation, the vapor being positively charged, and the water being negative; Dr. Lloyd regards them as effects of solar heat; while M. de la Rive ascribes them to chemical actions going on in the interior of the solid crust of the earth, the electricity being transported into the atmosphere by evaporation.

Mr. Ellis, of the Greenwich Observatory, has shown the intimate relation between solar action and the regular diurnal magnetic changes of declination and horizontal force at Greenwich Observatory during thirty-five years from 1841 to 1876, by a comparison of the observations of those elements. The results of his observations are shown on a large diagram which has been enlarged from his curves, and they show what a close relationship exists between solar storms and terrestrial magnetic changes. There are not only daily and yearly periods of the variations of the different magnetic elements, but there also seems to be in the horizontal intensity a period of twenty-five or twenty-six days, which is the time of rotation of the sun on his axis. Other recent investigations have shown that these regular magnetic changes depend not only on the sun, but that they are also in part due to the action of the moon, and these portions depend upon the length of the lunar day and on the position of the moon with regard to the earth. Just as there are regular earth currents whose direction depends upon the sun, which we may call the solar earth currents, so there are lunar earth currents which go through their changes under the action of the moon, and it has been shown that the effects are produced not immediately under the moon, but

there is a lagging behind in the case of lunar earth currents, just as in the case of solar earth currents. In the case of the lunar earth currents we cannot attribute the production of the electricity either to heat or to thermo-electric currents from one part to another of the earth's crust, and we must, therefore, look for some other source. May we not find it in the fact that the moon causes tides in the solid crust of the earth, just as she causes tides in the oceans? The earth's crust is made up of elastic materials and materials capable of yielding and altering their form to a considerable amount with the change in the direction of the pull of the moon upon them. This crust also contains magnetic substances in abundance which alter their form under the moon's attraction, and so from the changes of position of masses of magnetic matter changes are produced in the magnetism of the earth which must give rise to induced currents of electricity or earth currents. Let us imagine a conductor of electricity outside the earth, stretching from the North Pole to the equator, and fixed in space with the earth, a magnetic body, revolving beneath it from west to east; then it follows, from Faraday's laws of induced currents, that the revolution of the earth on its axis would cause a current in the fixed conductor in a direction from the pole to the equator.

If the conductor moved over the surface of the earth from west to east, and the earth did not revolve, or revolved at a slower rate, then the current in the conductor would be from the equator to the pole. The current depends upon the relative motion of the earth and the wire. If then we have an insulated wire running north and south, the tides in the earth's crust, of which I have spoken, will be equivalent to a lagging behind of magnetic matter, and so we may expect in that wire a current of electricity whose general direction would be from the equator to the pole. The position of the wire with reference to the magnetic pole of the earth would modify the direction of these earth currents, and it is quite conceivable that the position of England with regard to the magnetic pole might cause these regular earth currents to be greatest in the southwest and northeast direction. The lagging of the lunar earth currents behind the position of the moon would also be accounted for by the lagging of the tides behind the moon. If this is a true cause for some portion at least of the lunar earth currents, then the same reasoning applied to the sun may in a smaller degree apply to the case of the regular solar diurnal earth currents, and may help to account for the lagging behind of the effects due to the sun, so that the fact that the greatest solar effect happens about 2.30 P. M. may not be entirely due to the fact that that is the hottest part of the day, but may also in part depend upon the tides.

We have now to consider those more sudden changes of the suspended magnets, which are distinguished by the name, magnetic disturbances. In 1874 Dr. Lloyd said of them: "The duration and the magnitude of these oscillations are as yet outside the domain of law, and probably depend upon so many operating causes that, like the gusts and lulls of the wind in an atmospheric storm, they will long baffle all attempts to refer them to their actuating forces, or even to reduce them to order."

Certain facts relating to these disturbances have long been known. From the series of observations started by Gauss in 1834, and made every five minutes at the same time at a variety of places, at first in Europe and afterwards in various parts of the world, the disturbing power was found to increase in northern latitudes; also it was made out that the appearance of a disturbance in several places

occurred at the same time, but there were great differences in the results at different places.

In Europe the agreement was very good, and also in America; but the agreement between Europe and America was not so satisfactory.

The force seemed to originate in a certain point in the interior of the earth, and the direction of the disturbing force seemed to be constant; yet sometimes there were great differences in the deviations at places not far apart, and from the result of his observations Weber was led to believe that there was a center of disturbances which was somewhere in the neighborhood of St. Petersburg.

However sudden and unconnected single disturbances may seem to be, they still follow certain laws in their occurrence; Sabine found that they had daily and yearly variations from their mean values and that they have an eleven-year period, which agreed with the eleven-year period of the appearance of spots upon the sun.

Disturbances are more frequent in summer than in winter, and this applies to each hemisphere; and it has been confirmed by various observers that they are also subject to the influence of the moon. Lamont says of these disturbances: "Their cause is a force which is subject to certain laws, but which does not act constantly; the mean direction and frequency have yet to be discovered."

Observations have shown that the magnetic disturbances and electric currents on the earth are so nearly related to one another that people naturally look upon the electric currents, either in the crust of the earth or in the atmosphere outside it, as the cause of the magnetic disturbances. These currents in the earth have usually been attributed to changes of temperature, because they also are found to be in some way governed by the sun.

Now let us come to more recent observations of magnetic disturbances with the improved methods of recording observations by photography which are now available. For some years past photographic records have been taken of the magnetic elements, but the curves have been laid aside, and very little use has been made of them; so much so that some three or four years ago a circular letter from Mr. Ellery, director of the Melbourne Observatory, was sent round to those scientific men who were supposed to be interested in the matter to know whether it was advisable to continue the photographic records of magnetic changes at Melbourne, which is the most southern station, and the only station in the southern hemisphere except Mauritius where such observations are taken. Mr. Ellery did not for one moment suppose that they were of no value, but as no use was made of them he wished to know whether the money expended might not be better applied to another purpose. This matter has been taken up by Kew Committee, of which Dr. de la Rue is chairman, and a recommendation was made that the directors of all observatories which possess instruments of the Kew pattern should be invited to send to Kew their photographic records, or careful tracings of them, for a given period, so that a comparison might be made of the results.

The period chosen was the month of March, 1879, and records for the whole month have been sent from Lisbon, Coimbra, Stonyhurst, Vienna, St. Petersburg and Bombay, in the northern hemisphere, and from Melbourne and the Mauritius in the southern hemisphere.

A preliminary account of a comparison of the declination curves from the European stations was brought before the British Association last year at Swansea, and this evening I have to bring before you some further points which come out of these

comparisons. Let us take the disturbances on March 15-16, 1878, which will illustrate some of the points which I wish to bring out prominently.

Not only do magnetic changes occur at the same time at different stations, but there is a great similarity between them.

It must be remembered that at the northern stations the horizontal force is smaller in proportion to the whole force than it is at stations nearer to the equator, so that the same disturbance will produce less effect on the horizontal force or on the declination needle in latitudes near the equator.

Also the needles at different stations are by no means in the same state of sensibility, and even at the same station they change with time, so that they are not always equally sensitive, and when they lose their magnetism they have to be remagnetized.

We see that soon after 10 A. M., G. T., on March 15, 1878, there is a disturbance wave showing first diminution and then an increase in the horizontal force at St. Petersburg, Vienna, Kew and Lisbon. At Melbourne, in Australia, there is a similar disturbance at the same time both in the declination and in the horizontal force.

Again, between 2 and 3 and between 4 and 5 P. M. there are very small disturbances showing themselves at the same absolute time in the horizontal force and declination curves. About 5.20 P. M. there is a well-marked increase in the horizontal force and eastward deflection of the declination needles. About 9.30 P. M., G. T., a storm begins which lasts about an hour. It is felt in the northern and in the southern hemispheres, near to and on both sides of the equator. At all European stations the horizontal force is increased during the first part of the storm, and then diminished.

At Lisbon the vertical force is first increased, and then diminished, and at St. Petersburg and Stonyhurst there is a diminution in the vertical force at the same time as at Lisbon. If we regard the declination needles, we find that at St. Petersburg, Zi-ka-wei and Melbourne, and at Bombay, the declination westward is first increased and then diminished, whereas at Kew and Lisbon the motions are in the opposite direction.

The declination at Vienna seems to be intermediate between Kew and St. Petersburg, but the curve is incomplete.

At Bombay and the Mauritius, near to but on opposite sides of the equator, the declination needles are deflected opposite ways. The local time at these places was from 1 to 2 o'clock at night.

(To be continued.)

WHAT INVENTION MAY DO.

The possibilities of science when applied to the industrial arts are so very great that careful people hesitate to state them for fear of exciting ridicule. So, in articles which have recently been published in London as well as in New York, a humorous turn has been given to some of the possible results of inventions in these days.

Were an Englishman of the time of Elizabeth to have been told that water would be supplied to every house by means of pipes, that a combustible gas would be distributed in a similar manner from a central reservoir, that messages would be sent across continents and under oceans in a few minutes, he would have set down his informant as a lunatic, or, at best, the very wildest of dreamers. The man of to-day would be quite as incredulous if told what inventions and applications of science may do for the people of 1981.

One writer ventures to predict that in the twentieth century electricity will accomplish marvels which now seem too absurd to seriously set forth. Chops and steaks will be cooked by electric sparks so as to make the Frenchman's cotelette a la minute a reality. The fruits of the earth will be multiplied enormously by the use of electric light behind colored glass. Fruits and vegetables will be grown all the year round, winter and summer, day and night, so that the fields which now produce a hundred bushels of any product will yield ten thousand. We now cook our food, but take our air and water raw, and through these two elements come all the disorders and contagions which afflict humanity. In the future water will be distilled and prepared for human use, and thereby purified from all germs of disease, while air will not be breathed by human beings until it has been cleared of all noxious qualities, after which it will be admitted to the glass-covered streets and dwellings in which the man of the future will live. Houses and places of business will be inclosed in immense inclosed edifices, the air of which will not only be rendered wholesome, but delightful to the sense of smell. Summer and winter, so far as extreme cold or extreme heat is concerned, will be abolished, as the temperature can be controlled by artificial means. Day will have no attractions over night, for the artificial lights will be more pleasing than any which the great luminary of day can give us. Then, of course, the air will be navigated, which will help to change the appearance of the surface of the earth, for the great cities will then be situated on healthful hilltops, instead of the insalubrious plains below. With the great motors shortly to be discovered, huge mountain chains which obstruct man's progress in any direction can be leveled, while the ice packs around the two poles can be liquefied and made navigable.

All this seems wild enough, but no doubt very great changes will occur. If food can be produced by improved methods, with less cost, the problem of poverty is solved. If machinery continues to replace handwork, the hours of labor must be shortened and its value increased; but to accomplish this, a social revolution will be needed by which labor-saving machines will be worked for the benefit of the laborer, and not in competition with him.—*Age of Steel.*

[For the JOURNAL OF THE TELEGRAPH.]

MATHEMATICS IN TELEGRAPHY.

BY AUGUSTIN M. FERNANDEZ, A.B., M.D.

THE question of how far technical education bears upon the successful working of any handicraft, has always been a vexatious one; and to-day that telegraphy and the practical applications of electricity are becoming more and more indispensable to our modern civilization, it is of great importance to telegraphists to pay some attention to the subject. For the true understanding of *ohms*, *megohms*, *volts*, *watts*, *farads*, *microfarads*, etc., and the solution of the equations they involve, an elementary knowledge of mathematics is undoubtedly necessary. But, at the same time, how far the lack of this knowledge affects the practical working of the operator at an instrument is a matter that opens a wide field for discussion.

When Watts says, "The best way to learn any science is to begin with a regular system, or a short and plain scheme of that science well drawn up into a narrow compass," he points out the utility of some method of training in the professions. In none of them is this more evident than in the medical profession—as a natural consequence of its vital

importance—but the same truth holds good to a certain extent in the different handicrafts.

The telegraphist who has the noble desire of intelligently working at the instrument reads treatises on telegraphy and the journals dedicated to the subject. He cannot fail to perceive the great advantage that an elementary knowledge of mathematics would afford him. How can he otherwise be able to understand such simple problems as, for instance, the following for the localization of a contact between two wires?

$$X = \frac{r - \sqrt{(Lm + L'm' - r)(R - r)}}{m - m'} \dots \text{statute miles,}$$

in which

L = the length, in statute miles, of one of the lines;

m = its resistance per statute mile;

L' = the length of the other line;

m' = its resistance per mile;

R and r = resistance in ohms, with further ends insulated and connected.

On the other hand it is a curious fact that great discoveries have been realized by men of very little scientific knowledge, and that great men have made scientific researches with the simplest apparatus. Could it be possible that technical education so fills up the mind as to deprive it of competent ability for practical purposes? When we compare the limited mathematical knowledge of the English and American telegraph operators with those of France, Germany, or Switzerland, where special scientific schools of training are established for them, and the undeniable fact that the operators of those countries are far inferior in practical skill to their comrades of the United States and of England, we feel obliged to admit that the labor of overcoming tangible difficulties teaches more useful things than the easy following out of theories. It may perhaps also be true that the piling up of scientific truths in the mind without a proportionate amount of physical exertion (always accompanied by petty pleasures) with which to relieve the mental energy, tends to obliterate rather than improve the healthful action of the brain. Prof. Ayrton states that the reason why English telegraph engineers have hitherto been considered the first in the world is because they started earliest in the race; but that does not seem to us to be the explanation (granting his first proposition to be true), for we find that telegraph engineers in the United States, having started later in the race, are fully up to the standard of their English cousins.

But let it not be understood that we advocate the present method of preparing operators in this country for the discharge of their duties. An endeavor must be made to have men in the profession not only able to receive and to send a certain number of words in a given time, but men who have some elementary education, so as to be able at least to adapt their communications to grammatical formulae. Higher attainments ought to realize to their possessor advantages which the less accomplished would scarcely have reason to expect or hope for, thus creating that spirit of emulation among all, which will bring the profession of telegraphy to a higher and higher standard, and to keep pace with its sister professions in the advancement of our modern civilization.

A TELEGRAM from Berlin says that the Minister of Posts and Telegraphs has followed the example of the English Postmaster General, and asserted that the establishment of telephonic communication between houses is a part of the Imperial monopoly.

Journal of the Telegraph.

PUBLISHED MONTHLY AT 196 BROADWAY.

THE JOURNAL is issued on the 20th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,730 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....\$ 1.00
One Copy, six months, postage included..... .75
Single Copies, 10 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$ 2.00
Half Inch " " 1.00
Quarter Column, " 4.00
Half " " 8.00
One " " 16.00

Outs charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, MARCH 1, 1882.

ANNOUNCEMENT—CHANGE OF PUBLICATION.

THE JOURNAL OF THE TELEGRAPH will hereafter be issued only on the 20th of each month, instead of semi-monthly, as heretofore.

The next issue will, accordingly, be issued on March 20th.

Subscriptions are reduced to \$1.50 per annum. Those who have paid in advance will be credited on next year's subscription, or the money returned if they desire it.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, February 18, 1882.

Business frank No. 345, issued on account of the St. Paul, Minn. & Manitoba Ry., is hereby revoked. Managers will please take it up on presentation and return to this office for cancellation.

JNO. VAN HORNE,
Vice President.

LIFE AND AGE OF A TELEGRAPH POLE.

THIS subject may seem of trivial account to the great mass of business people, but when it is proved to them that it actually affects the cost and convenience of telegraph messages and of dividends to stockholders, an interest may be awakened that will make the inquiry on the subject one of unusual interest, inasmuch as it affects the high or low price of rates for messages. The original cost of the erection of telegraph lines is important, but not so important in a series of thirty or forty years as is that of its maintainance in working order during that period. Some of the lines now owned and used by the Western Union Telegraph Company were first built more than forty years ago. When one is told that they have been built three or four times since that at great expense, it would seem to

lead to the conclusion that a large amount of capital is necessary to represent the actual cost of the telegraph lines which have been in existence for many years.

The size of a telegraph pole has much to do with the duty which it is expected to do, that is, the number of wires it is calculated to carry. Many telegraph companies now owned by the Western Union Telegraph Co. of to-day were organized and their lines built many years ago before the organization of the "N. Y. & Mississippi Valley Printing Telegraph Company" in 1851, its name being changed to that of the "Western Union Telegraph Company" in 1856 by an act of the legislature of New York State.

The contract to build the original line required that the posts be not less than thirty feet long and twenty-seven inches or more in circumference, four and a half feet from the butt and twelve inches in circumference at the top, and set in the ground five feet. There were to be at least thirty of these posts to the mile and they were to carry two lines of iron wire, one of which should weigh not less than six hundred pounds to the mile, and the other not less than four hundred and fifty pounds to the mile. These posts were to be of the best and most durable timber obtainable along the route they were to be stationed. These posts were intended for light lines only. When it was found necessary to increase the number of wires, it was found to be necessary to have larger and more heavy poles, not necessarily much taller only in cities and large towns.

When considered apart from any local catastrophe or universal storm, the poles which were out in winter were found to last as follows according to the wood used, without being renewed: Cedar, 16 years; chestnut, 13 years; these are used in the Eastern, Middle and Western States; juniper and cypress are used in the Southern States, and redwood is used in California. Spruce lasts 7 years and juniper 13 years. If poles are out in the summer their life will be about five years shorter than if cut in the winter. The soil in which they are set, and also the atmosphere and sunlight has much to do with their life, for if one breaks off at the surface of the ground, or near the surface, as is usually the case, it will be five feet or more shorter than the others, and hence it is generally regarded as unfit to reset, and a new one must take its place. In some locations this is provided for by having all the poles long enough to reset if they are sound enough for it to be economical to do so. The average period of the usefulness of a pole under ordinary circumstances is as above mentioned. It is seldom that mixed woods are used on a line; they are all of one kind of wood.

The official return of the Western Union Telegraph Co. to the Superintendent of the United States Census, in July last, shows the following facts as to the poles used during the year: Average length of poles, 27 feet; diameter at top, six inches; kind of wood used, cedar, chestnut, juniper, cypress and redwood. These poles were obtained in

all parts of the United States and in Canada. The average cost of each pole delivered without freight was one dollar and two cents. All these poles were round except about one-fiftieth, which were sawed or squared. No process was used for preserving poles, and their average life according to the wood used and the location where set was 12 to 15 years, and most durable wood in favorable situations did not exceed 25 years. The woods preferred were red cedar, white cedar, chestnut and redwood. It is to be observed that pine and hemlock are not used. It may be remarked here that American telegraph poles make an agreeable contrast with the crooked and unsightly larch poles used in England.

The falling of a pole generally does much damage to the arms, insulators, and wires. If they were all put up new at once, plain wire will last from 12 to 15 years and the galvanized wire used at the present day, being the best conductor, will last in the most favorable atmosphere for from 16 to 20 years, but no longer, and where there are strains by poles or wires falling they will not last so long, and in cities and large towns where there is much gas and moisture it will not last more than two or three years. At all events when a line begins to be about ten or twelve years old, and has plain wire, it is regarded as unreliable, and the safest and most economical way is to rebuild it, throughout, of new materials. The cost of constant repair and isolated and frequent transportation of posts and other materials, and the labor of repairs and re-setting cost almost as much in a short time as it would to rebuild. The cost of new wire and insulation is about \$15 per mile. The gauge of wire and the number of pounds to the mile is as follows: No. 4, 730 lbs.; No. 6, 540 lbs.; No. 8, 380 lbs.; No. 9, 320 lbs.

From these facts we can see that a telegraph line that is thirty-six years old has been entirely rebuilt three times at least under the usual course of things, and that it may have been nearly four times rebuilt. The trunk lines of the Western Union Telegraph Company were first built more than thirty years ago, and nearly all of their lines have been rebuilt at least once. Where a line is built for only a few wires and it is proved that more are required it is then necessary to rebuild it entirely with longer poles, and in such case all wires are also put up new, if they are expected to be in constant use.

The assertion that the nominal capital of old telegraph companies should only be the amount of the value of their property actually in existence at a particular time after a long period of years does not accord with the idea that it should also represent the amount of it expended for the property of the company. According to the above facts, if the original capital of a telegraph company is doubled every twelve or fifteen years, even without any increase of lines, it would only be keeping up the representative capital with which it established its business.

In another column will be found an excellent article on "Mathematics in Telegraphy," by Augustin

M. Fernandez, A. M., M. D., formerly superintendent of the private telegraph lines of Messrs. Polledo Rionda & Co.

If you want to become a telegraph operator, send twenty-five cents to O. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

VOLTAIC ACCUMULATION.

In January Mr. Swan repeated his lecture on the above subject, given in our last issue, before the literary and Philosophical Society of Newcastle. As Mr. Swan's second lecture contains much of importance that was not given in his former paper before the Chemical Society, we herewith reproduce a portion of it.

After alluding to the Faure and Planté cells, Mr. Swan said:—

"At a recent meeting of the Royal Society, a paper on a new electrical storage battery, communicated by Henry Sutton, of Ballarat, Victoria, was read. This paper describes various experiments in electric storage, and speaks of the great effectiveness of an arrangement which is a sort of cross between Daniell's and Planté's cells. In Sutton's arrangement the copper plate and sulphate of copper solution of Daniell is retained, but used in conjunction with a plate of lead amalgamated with mercury, instead of a plate of zinc amalgamated with mercury. The metals of the Daniell cell consist, as I have said, of a copper plate and a plate of mercurialized zinc. The metals of the Sutton cell consist of a copper plate and a plate of mercurialized lead—a very small difference in sound, but making a world of difference in the action of the cell—completely inverting its action, in fact—for in the Sutton cell the copper plays the part that zinc ordinarily plays, and the lead plays the part which copper ordinarily plays in voltaic cells. That is to say, the copper is the metal which, during the giving out of current by the cell, becomes oxidized, and is, therefore, the positive metal. In the Daniell cell it is the negative metal. Mr. Sutton says that in process of charging the cell the lead readily oxidizes to a great depth, the peroxide forming a regular layer on the surface. From experiments I have made I can fully confirm Mr. Sutton's statement as to the facility with which a thick crust of peroxide forms on the mercurialized lead in the cell—giving it, as he says, large capacity of storage. The discovery of this means of rapidly forming a thick coating of peroxide is invaluable. It is to the large quantity of oxide of lead applied to the lead plates in Faure's cell that its great storage capacity is due; but to form the oxide out of the plate itself, as Planté does and as Sutton does, and as in another way I am able to do, is better than to apply the coating of oxide as M. Faure does—provided we can get a thick enough crust—and according to Mr. Sutton's method, and my own also, I have no doubt we can. While experimenting with Sutton's cell, I found a troublesome tendency in the copper deposit to spread and form a connecting link between the copper and the lead plates, which quite destroyed its efficiency. It therefore occurred to me to discard the copper solution and the copper plate after the coating of peroxide had been formed on the lead, and to use the oxidized coated lead plates alone with dilute sulphuric acid, as in Planté's cell. I therefore rearranged the oxidized plates in this manner, and I am glad to say I have obtained the most excellent results with the cell thus modified. The storage capacity is large, and the cell works well in every way. It is evidently possible to produce the oxida-

tion of the mercurialized lead plates by means of copper solution—either before the plates are built into the form of cells, or while they are in that form—that is a mere matter of convenience in constructing the cells. While the subject of electrical storage of energy is occupying so large an amount of public attention, I think it is desirable to avail myself of this opportunity of publishing the results I have obtained with Sutton's cell, and also with the modification which I have described."

Speaking of the possibility of lighting trains by means of incandescent lamps and storage cells, Mr. Swan said: "For lighting railway carriages I think the most feasible arrangement will be to have a small dynamo and set of store cells for each carriage. The arrangement for working the dynamo might be extremely simple. The armature might be attached to one of the axles of the carriage. Whenever the carriage moved there would be a current of electricity generated if the circuit were closed through the lamps and store cells. When the cells were full they could be thrown out of action automatically. The amount of power absorbed by the armature would be quite insignificant. The cells might be of such a size as to keep the lamps lighted for an hour or so after the carriage had come to a standstill. The same dynamo could be easily applied to store currents in another set of cells to be used for the working of an electro-magnetic brake, which might be of great power with very small abstraction of the motive power of the engine, for the principal of accumulation comes into play here most advantageously. Whether railway carriages and tram cars are to be in future driven by electricity is not yet quite a settled question, but it is certain that whenever (if ever) they are so driven electric storage of energy will play an important part in bringing it about. Some people have the idea that by means of store cells we shall have portable electricity extensively employed. A daily supply of electrically stored energy, delivered at your door like milk, the empty cells to be taken away at the time the full ones are brought. From what I have already said it is evident that this idea is not likely to be realized. There is no form of energy so easily conveyed to a distance as the energy of electricity, and to think about carrying it about in boxes instead of sending it on its distant and repeated journey through wires is to ignore and waste one of its most valuable properties. The probability is, that in every house there will be a fixed set of cells occupying a place, and perhaps also a space not unlike that which a water cistern occupies in a house. These cells will be in communication through insulated and hidden wires with a main central electric supply, and will either be kept charged by continual connection with the main—as our water cisterns are—and with a regulating appliance equivalent to the automatic feed of a water cistern, or the current will be turned on for a few hours each day until the cells of one district are fully charged, and then the current will be returned on to another district to charge the cells of that district."

"Where electricity is wanted for lighting during the hours of the dark and for performing any kind of occasional and inconstant work, electric storage of energy leads to reduction in the size and cost of the motor apparatus for generating electricity, and does away with the necessity of keeping it in action during the whole time electricity is drawn off from it. If electricity is only required to be supplied during three or four hours each evening, engine power and dynamo power of one-half or one quarter the size that would have been required without storage will be sufficient,

and with the great advantage that if a small proportion of the electrical work extends over a longer period—say for keeping a few lights burning—it might be during all the twenty-four hours—although the engine and dynamo may have been in action during only the daytime, or even during only a part of the day—the stored electricity will be sufficient to give either light or power to the extent required wherever it may be wanted. Here is a piece of apparatus invented by Sir William Thomson, which enables storage cells to be used in conjunction with a dynamo electric machine in such a way that there is no waste of motive power. By the automatic action of this apparatus the cells are kept constantly charged; while the current is not being drawn off the dynamo is thrown out of action, and when the current is used, power is absorbed in just sufficient amount to keep the store cells fully charged; or if the current is drawn off so rapidly that the dynamo cannot keep the cells fully charged, both machine and cells contribute current, and in that way, the cells and dynamo together are able to do more in a given time than the dynamo alone could do—enabling us, in fact, to obtain the utmost advantage possible from the combination. It is impossible to fully realize the consequences that must follow from the combination of electrical storage of energy with the dynamo electric machine. The dynamo electric machine standing alone and unsupported by electric storage of energy, is truly a great power, largely tending to develop the practical use of electricity—but, in alliance with secondary voltaic action—the practical value of the dynamo electric machine is increased a hundred fold. They are inseparable. Neither is complete without the other. Things that were impossible to be done with the unaided dynamo can now be easily accomplished by this combination. One of the results of the combination of the dynamo with store cells will be, that primary currents of higher tension than would have been convenient or safe to use directly can now be used in such a way as to entirely get rid of the danger and inconvenience of using such currents, and yet gain the full advantage of economical distribution of current from a central station over a wide surrounding area. But these advantages are not obtained without some sacrifice. In taking the electric current at second-hand through the store cells, instead of directly from the dynamo electric machine, there is a waste of energy amounting to between 10 and 20 per cent. This is an amount of loss that we can well afford to bear for the many advantages electrically-stored energy gives us. We can, as I have shown, obtain electricity directly from heat; but so far, not economically, that is to say, an even greater loss—probably double the loss—which attends the development of motive power through the steam engine attends the development of electricity by the direct action of heat. Only about five per cent. of the actual energy stored in fuel is utilized in a thermo-electric pile. But there is every reason to hope that the thermo-pile may be improved—perhaps more than doubled in its efficiency—and whenever such an advance takes place then the thermo-pile will occupy a useful place among apparatus for generating electricity for electric lighting and other purposes, and especially in conjunction with store cells. My attention was drawn to this point by Mr. Higgins, of London, who has worked with thermo-piles to a considerable extent. Mr. Higgins pointed out to me that one of the difficulties in connection with the use of thermo-piles was their liability to deteriorate through expansion and contraction incident to intermittent use. And he suggested that by combining store cells with a thermo-pile this dif-

faulty could be completely avoided, the thermo-pile being made to act continuously on the slow-combustion stove principle, the store cells acting as an accumulator. With reference to the application of electricity to the production of motive power, at present we depend on motive power for the production of electricity. It is, therefore, a roundabout process to reproduce motive power from motive-power-produced-electricity. Still, there are cases in which the economy of producing motive power on a very large scale, and the facility with which this power may be subdivided and distributed by means of electricity, will make the reproduction of motive power in this roundabout way both economical and convenient; notably in cases where at no great distance from a town or populous district requiring motive power for industrial purposes there is some great stream or waterfall; and, in connection with electrical storage, it is within the scope of probability that the fitful power of wind and the intermittent power of tides may be made more practically serviceable in the development of motive power."

ELECTRICITY AND LIGHT HOUSES.

The electric light has, of course, occupied much of the thought of all light-house establishments, and it is now in use in several English and French light-houses, but it is still a question as to whether there is any special advantage in its use. In ordinary weather the present first-order lights can be seen as far as the curvature of the earth will permit; in fog no light can be seen, the sun itself being obscured. As we can never hope to make an artificial light as powerful as the sun, the question of the practicability of furnishing a light which will show through a fog may as well be dismissed at once, and the question as to what kind of light can be seen for the greatest number of hours in the year is the one to be decided, and this is one not so easily answered as one may casually think. The extreme whiteness of the electric light and its deficiency in red rays seems to be a great defect. Very conclusive French experiments seem to show that such deficiency is fatal to the penetrative power of a light. These experiments, made under Governmental supervision, are very striking, especially when it will be remembered that from 70 to 90 per cent. or more of the original white light is cut off by the invention of the red medium. The following is the official report on this subject:

"Five flames regulated in such a way that four of them being covered with glass colored red of copper, silver, or gold they all appeared of the same photometric intensity observed at .80 of a metre distance. The intensity had been fixed at .005 of a carcel burner, so that the limits of ranges could be reached without going outside the inclosure of the Camp de Mars, within which the experiments were made. The sky was clear, the night dark, and the observers, four in number, reported as follows: '1. At a distance of 500 metres the white light ceased to be visible, while the red lights, except the red of gold, were still quite bright. 2. At 750 metres the same lights remained visible, but the red light was distinct only in the light which was covered by a glass colored very strongly with copper, its absorption being estimated at ninety-nine one-hundredths of the white light.' Other experiments with more powerful lights were made under the same atmospheric conditions, 'but it was always found that the intensity of the red light diminished much less rapidly than the white as the distance increased.' The red of copper in every instance was found superior to that produced by any

other metal. The report of trial in fog is as follows: 'The red lights are much superior to the others, because red rays are much less obstructed in their passage through them; the red rays of white lights pass through such fogs, while the others are rapidly absorbed, and green lights, after becoming white, rapidly diminish in intensity. Five reflectors producing white lights of about 60 carcel burners in the axis were observed during fog. The light of the first was uncolored, that of the second red by gold, that of the third red by copper, that of the fourth green, and that of the last blue. All ceased to be visible at the distance of 1,600 metres. The color of the red of gold was with difficulty distinguished at 1,500 metres, while that of the red light colored by copper was still well defined. The green light disappeared at 1,000 and the blue light at 530 metres.'"

This is a very extraordinary result, it being remembered that possibly quite eight-tenths of the original light being obstructed by colored medium, the remaining two-tenths, wholly red, carried as far as the unobstructed white light of five times the intensity. It shows that the primal intensity is not always a surety of furthest range, but that of two given lights the one having the greatest quantity of red rays is the best. The Light-house Board has several times asked for an appropriation to make the necessary experiments on a large scale with an electric light, but has heretofore been refused. It is intended, if the request for the \$50,000 needed is granted by the coming Congress, to establish an electric light in one of the towers of the Highlands of Navesink light-house, where the two lights of this station, being 228 feet apart, an excellent base is afforded for comparative experiment; the Sandy Hook light-houses and the two light-ships off Sandy Hook will afford excellent stations where the observations of intensity and visibility can be made. —*Aids to Navigation—Lieut.-Commander F. E. Chadwick.*

ABNORMAL TIDES AND ATMOSPHERIC WAVES.

The great "cold wave" which reached the Atlantic coast on Monday caused a rare tidal phenomenon which scientists and seamen may well study. Unprecedentedly low tides were reported from the shores of Staten Island, and the Split Rock, near Tompkinsville Landing, which, it is said, has not been seen for about twenty years, projected two feet above the water, and on the south shore many acres of beach, usually submerged, were entirely dry, as also were the great oyster beds at Prince's Bay, near South Amboy, Robbins' Reef, Oyster Island and Old Tom Reef, in the upper bay. A similar state of affairs was reported from Long Branch, and dry land could be seen beyond the end of the iron pier at Rockaway beach. The navigation of the harbor was generally and seriously impeded by the tidal oscillations as the vast atmospheric wave of high pressure suddenly swooped down on our littoral waters.

These tidal phenomena were due not merely, as many would suppose, to the force of the northwest gale, which on Monday morning was blowing in the harbor at a velocity of only twenty-two miles an hour. Another cause for the remarkably low tide (and a cause but little noticed by scientific writers upon tidal irregularities) was undoubtedly the rapid rise of the barometric pressure on the bay. Between Sunday and Monday morning the air pressure, as reported by the Signal Service, rose .56 of an inch in this city, and in the forty-eight hours ending at 7 A. M. on Tuesday, the barometer

made the extraordinary leap of 1.03 inches. Several years ago Admiral Fitzroy pointed out that "one cause of water rising on the shore before hurricanes or gales of wind, is lightened pressure on the surface of the sea, as indicated by mercury being low in the barometer." This has been specially noticed at the island of Mauritius, in the Indian Ocean, and on the River Plata, at both which places the water swells up to an unusual height when a cyclone is approaching and the mercury in the barometer is sinking.

As the normal atmospheric pressure at sea level is about a ton to the square foot the oscillation of the barometer as much as a single inch signifies an enormous alteration of pressure—equivalent to nearly a million tons on each square mile—obviously capable of causing an immense displacement of the water. The sea wave created by the great cyclonic depression which assailed Calcutta on October 5, 1864, as it struck the coast broke ten feet above the mark of the highest spring tides and laid the whole level country at the mouth of the Ganges under water. The reverse of this evidently took place in New York Bay in Monday's anti-cyclone, the high pressure and northwest winds driving the surface water bodily seaward, and seriously embarrassing navigation.

This occurrence strikingly illustrates the value of an extension of the weather forecasts by which the pilots and shipmasters on the coasts might be forewarned of barometric fluctuations likely to cause dangerous changes in the tides. If the Signal Service reporting stations could be extended further into Manitoba, whence the great high pressure waves come, such tidal phenomena as were witnessed in this harbor on Monday last could be easily predicted. It is needless to say that such forewarnings would be a great boon to local navigation at this port and along the Atlantic coast.—*N. Y. Herald.*

THE SANDY HOOK OBSERVATORY.

The large Western Union tower for marine observation has been successfully moved back from its former place at Sandy Hook, a distance of about 250 feet, this being found necessary on account of the surf coming too near its former position. The building is eighty feet high and built of wood. It is seven stories high, and has four rooms on the two lower floors occupied by the operators Mr. Farrell, one of them, has been there twenty five year, and Mr. Delamotte seven years.

BOOK NOTICE.

Incandescent Electric Lights, with particular reference to the Edison Lamps at the Paris Exhibition, by Compt. Th. de Moncel and William Henry Preece. To which is added "The Economy of the Electric Light by Incandescence," by John W. Howell; and on the "Steadiness of the Electric Current," by C. W. Siemens, 176 pp. New York: D. Van Nostrand, 1882.

This little volume forms No. 57 of "Van Nostrand's Scientific Series," which has been found so popular and useful. The subject of it is one that is of great interest to all, both in a scientific and economic point of view. The standing of the writers of these essays is so well known in the scientific world that whatever they write on the subject of electricity will be sought for and read by a large number of persons in both hemispheres. The work abounds in plates and diagrams so as to render it plain to all. It is sure to meet with great demand wherever it is known. The publishers have done well to print it in this convenient form for popular use.

MARRIED.

OLENDENWING—BEESE.—At the Parvis House Cincinnati, O., January 26th, '82, by Rev. W. H. French, of First Presbyterian Church, THOS. W. OLENDENWING, Agent and Operator at Matamoras, Ind., to Miss GEORGEA H. BEESE, Centerville, Ind.

BIRTHS.

FAGAN.—On February 23d, to GEORGE F. FAGAN, Stenographer General Manager's office, New York, a daughter.

TOWNSEND.—At Rockport, Texas, February 17th, 1882, to C. R. TOWNSEND, Manager W. U. Tel. office, a son.

GENERAL ORDER.

WESTERN UNION TELEGRAPH COMPANY, }
New York, February, 1882. }

To all offices:

For the month of February, 1882, and thereafter until further orders, business with the offices of the Great North Western Telegraph Company will be reported separately from business with Western Union offices. Managers will therefore make out the usual check report showing business with Western Union offices only, and an additional check report showing business with the Great North Western offices. The additional report should be footed and signed independently of the regular report, and should be endorsed "G. N. W. Report" at the top of the printed heading on the face of the blank and at the top of the filing on the back. The totals should be entered under and added to the totals of the regular report to form grand totals to agree with the account current No. 4.

Daily receipts from Great North Western business should be entered on the "Dr." side of account current as for "this" line, and in the report of "daily telegraph receipts" on blank No. 4 should be consolidated with the regular "this" line receipts.

Managers who receive a commission will be allowed the same percentage of Western Union receipts as heretofore, but it must be understood that of the "this" line receipts of the "G. N. W. report," but six-tenths are Western Union. If, therefore, the amount of commission is to be ascertained, it should be computed first on the "this" line receipts of the Western Union report, and then on six-tenths of the "this" line receipts of the "G. N. W. report." Four-tenths of the receipts of the "G. N. W. report" belong wholly to the Great North Western Company; nothing will be allowed from it for Western Union commissions.

Great North Western offices in Ontario and Quebec are indicated in the tariff book page IV, paragraph 10. Great North Western offices elsewhere are as follows:

| | | |
|------------------------|-----------------------|----------------------|
| MAINE. | 64 Dexter | 44 Paul Smith's |
| 28 Bethel | 39 Dresden, Wash'n | 44 Peru, Clinton Co. |
| 28 Bryants Pond | 66 Philadelphia | |
| 14 Falmouth | 68 East Constable | 56 Pierpont |
| 28 Gilead | 56 Edwards, St. Law. | 64 Pierrepont Man'r |
| 20 Lewiston Juno'n | 44 Elizabeth's, Es- | 44 Plattsburg |
| 20 Mechanics Falls | 44 sex Co. | 73 Plessis |
| 14 New Gloucester | 68 Ellenburg | 44 Port Henry |
| 14 North Yarmouth | 44 Essex | 44 Port Kent |
| 20 Norway | 64 Evan's Mills | 56 Potadam |
| 20 Oxford | 44 Ferrona | 44 Prospect House, |
| 20 So. Paris | 78 Fisher's Land'g | 64 Saranac Lake |
| 28 West Paris | 63 Forest | 39 Putnam, Wash'n |
| 14 Yarmouth | 63 Ft. Covington | 63 Raymondville |
| NEW HAMPSHIRE. | 56 Gouverneur | 44 Redford |
| 28 Berlin Falls | 64 Great Bend | 78 Redwood |
| 28 Gorham | 78 Hammond, St. | 56 Rensselaer Falls |
| 28 Milan | 63 Law's Co. | 64 Richland |
| 28 Shelburne | 56 Harrisville | 56 Richville Village |
| 28 Starkwater St'n | 63 Helena | 39 Rogers Rock H'l |
| NEW YORK. | 92 Henderson | 56 Russell |
| 64 Adams | 56 Honnerson H'bor | 82 Sacketts Harbor |
| 64 Adams Centre | 56 Hermon | 64 Sandy Hill |
| 39 Addison Juno'n | 56 Havelton | 64 Sandy Creek |
| 78 Alexandria Bay | 68 Hogan'sburg | 44 Saranac |
| 63 Altona | 39 Hulet's Landing | 44 Saranac Lake |
| 56 Antwerp | 44 Keeseville | 74 Soriba |
| 44 Ausable Forks | 56 Knappa | 56 Shingle Creek |
| 63 Bangor | 64 Lacoda | 56 Stockholm Depot |
| 82 Belleville, Jeffe- | 78 La Fargeville | 73 Theresa |
| son Co. | 56 Lawrence, St | 78 Thousand Island |
| 44 Black Brook | 63 Law's Co. | House |
| 44 Bloomingdale | 56 Lawrenceville, St. | 82 Three Mile Bay |
| 63 Bombay, 4 Cor's | Law's Co. | 89 Ticonderoga |
| 56 Brasher Falls | 82 Limerick | 63 Trout River |
| 64 Brownville | 56 Lisbon Centre | 64 Turin |
| 63 Brushton | 44 Leon Lake House, | 63 Waddington |
| 63 Burke | F'kin Co. | 64 Watertown |
| 44 Burleighs | 64 Lowville | 63 West Chazy |
| 56 Canton | 56 Madrid | 63 West Constable |
| 82 Cape Vincent | 56 Madrid Depot | 56 West Stockholm |
| 64 Carthage | 63 Malone | 44 Whallonsburg |
| 63 Champlain | 64 Manassville | 44 Willboro |
| 63 Chateaugay | 44 Martins | 63 Woods Falls |
| 82 Chaumont | 64 Martinsburg | 63 Woodville, Jeffe- |
| 63 Chazy | 63 Massena, St Law's | son Co. |
| 44 Cheever | 74 Mexico | VERMONT. |
| 63 Cherrubusco | 44 Moffitsville | 30 East Franklin |
| 39 Chubb's Dock | 56 Molra | 30 East Rich'd St'n |
| 44 Clayburg | 63 Moore's Forks | 30 Island Pond |
| 78 Clayton | 63 Moore's Juno'n | 30 Lake |
| 63 Clinton Mills | 56 Morley | 30 Newport Centre |
| 44 Clintonville, Clin- | 64 Natural Bridge | Station |
| ton Co. | 74 New Haven | 30 North Troy |
| 56 Colton | 56 Nicolville | 30 Norton Mills |
| 64 Constableville | 63 Copenhagen | 23 Wenlock |
| 56 Cray's Mills | 56 Norwood | 30 West Berkshire |
| 39 Crown Point | 73 Ogdensburg | |
| 63 Dannemora | 73 Omar, Jefferson | |
| 64 Deer River | Co. | |
| 56 DeKalb Junction | 56 Parishville | |

THOS. T. ECKERT,
General Manager,

Tariff Bureau.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, March 1, 1882.

To all offices on Western Union lines:

The following changes which have been made since February 15, 1882, should be entered in the Tariff Book as they will not be republished.

The following rates to new Squares 669, 670 and 671 should be entered on the new tariff sheet by offices in squares indicated in the first column.

| FROM SQUARE. | TO SQUARES. | | |
|--------------|-------------|------|------|
| | 669 | 670 | 671 |
| 484 | 75 5 | | |
| 448 | 75 5 | | |
| 452 | 75 5 | | |
| 453 | 75 5 | | |
| 460 | 75 5 | | |
| 461 | 75 5 | | |
| 486 | 60 4 | | |
| 486 | 60 4 | | |
| 487 | 60 4 | | |
| 488 | 60 4 | | |
| 489 | 60 4 | | |
| 490 | 60 4 | | |
| 491 | 60 4 | | |
| 492 | 50 3 | 60 4 | 60 4 |
| 493 | 60 4 | | |
| 494 | 50 3 | 60 4 | 60 4 |
| 495 | 50 3 | 60 4 | |
| 496 | 50 3 | 60 4 | 60 4 |
| 497 | 50 3 | 60 4 | |
| 498 | 50 3 | 60 4 | |
| 499 | 40 3 | 40 3 | 50 3 |
| 500 | 60 4 | | |
| 509 | 75 5 | | |
| 510 | 75 5 | | |
| 587 | 60 4 | | |
| 602 | 75 5 | | |
| 608 | 60 4 | | |
| 669 | 40 3 | 40 3 | 40 3 |
| 670 | 40 3 | 40 3 | 40 3 |
| 671 | 40 3 | 40 3 | 40 3 |

Where no square rate is given and from all other offices the State rate will apply.

CHANGES.

ARIZONA.
On and after March 15, 1882, the rate on Night Messages to Globe City will be the Night Message rate for "this" line to Wilcox and full rate for "other" line. Erase "50 3 N.M. rate."

ARKANSAS.
Camden is no longer (N.M.) office. Erase "(N.M.)."

CALIFORNIA.
806 Callahans, closed.
749 Cross Creek, closed.
Grimes Landing, reopened.
764 Lompoc, closed.
Millville, reopened.
809 San Gregoria, closed.

CONNECTICUT.
Watertown reopened as W. U. office, square 37.

DELAWARE.
67 Mt. Pleasant. Erase "Summer office."

ILLINOIS.
337 Stonington reopened and is in Christian Co.

IOWA.
887 St. Gilman changed to 887 Ashton.

KENTUCKY.
Olive Hill now 50 3 Lexington, Ky, or 40 3 Huntington, W. Va.
Morehead now 45 3 Lexington, Ky, or 45 3 Huntington, W. Va.
Mt. Sterling now 25 2 Lexington, Ky, or 50 3 Huntington, W. Va.
Winchester now 25 2 Lexington, Ky, or 50 3 Huntington, W. Va.

LOUISIANA.
Managers of offices which exchanged messages with Arcadia between February 1st and 14th inclusive, are requested to

send Arcadia copies of such messages. Arcadia's records were recently destroyed by fire.

Until further notice messages for the "other" line office at Bastrop will be mailed from Monroe.

MASSACHUSETTS.

21 Pigeon Cove now * Pigeon Cove 10 0 by telephone, Rockport.

* East Templeton, now 50 0 Otter River.
28 Templeton Depot changed to 28 Otter River.

MEXICO.

* Colima now 400 40 Brownsville, Tex.
* Guadalajara now 400 40 do. do.
* Manzanillo now 400 40 do. do.

MINNESOTA.

190 Warren is now 889 Warren.

MISSISSIPPI.

851 Nesbit, closed.

NEBRASKA.

The tariff for "other" lines to Aurora, Bradshaw and Hampton is now 25 2 York. Erase "25 and 2 Plattsmouth."

* Calvert now 25 2 Nemaha City. Erase "25 2 Plattsmouth."

* Pawnee City now 35 2 Plattsmouth.

NEW JERSEY.

41 Atlantic Highlands is now open permanently. Erase "Summer office."

41 Deans. Erase "Ch. New Brunswick."

41 Marion, P. O. care Jersey City. Erase "Ch. Jersey City."

41 West End, Hudson County, Ch. Marion. Erase "Ch. Jersey City."

NEW YORK.

* Verplanks now 15 1 by telegraph, Peekskill.

NORTH CAROLINA.

* Greenville 25 2 (25 1 N.M. rate). Tarboro.
* Washington 40 3 (30 2 N.M. rate). Tarboro.

NOVA SCOTIA.

1 Mabon should read 1 Mabou.
* Meat Cove now 25 2 North Sidney.
2 Mabone Bay should read 2 Mahone Bay.

OHIO.

* Germantown now 15 1 by telegraph, Carlisle or Franklin.

OREGON.

Erase 738 Touchet.

PENNSYLVANIA.

* Clermont now W. U. office, square 111.
111 Dagucachonda. Send and Ch. Scachonda.
* Farmer's Valley now W. U. office, square 111.
111 Mc Cord Hollow, closed.
* New Hope, Butler Co., now delivered free from Bovard.
93 Summit, Tioga Co., changed to 93 Jackson Summit.
93 Thompson's Tioga Co., closed.
76 Watts Station P. O. Vesta. Erase "P. O. care Marietta."

SOUTH CAROLINA.

* Donald's, closed.
165 Grahamville, P. O. Ridgeland.
* Jonesville, closed.
* Lyles Ford, closed.
* Martins, closed.
* Pacolet, closed.
* Santuc, closed.
* Strothers, closed.
* Williamston, closed.

TEXAS.

* Laredo now 671 Laredo, (South).

VIRGINIA.

* Herndon, closed.

WEST VIRGINIA.

The following changes in the "tariff for other lines" Via Greenbrier W. S. Springs have been made.

| | |
|--------------------|----------------------|
| Brownstown, 35 2. | Kanawha Falls, 35 2. |
| Cannelton, 35 2. | Nuttallburg, 35 2. |
| Coalburg, 35 2. | Paint Creek, 35 2. |
| Cotton Hill, 35 2. | Sewell, 35 2. |
| Hawks Nest, 35 2. | |

ATLANTIC CABLE.

The cable between Hong Kong and Amoy and between Amoy and Shanghai has been repaired.
The cable between Shanghai and Fagasaki has been interrupted, leaving only the Siberian route to Japan.

CUBA CABLE.

The cable between Antigua and Guadaloupe repaired, restoring communication to all West India Islands.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in three columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

3-5 Bangor. 293 Falkville. 324 Prichards.
2-4 Calera. 267 Nolasulga. 366 Stock Mill
323 Apes.
* Ft Morgan, 75 5 Mobile
* Gainesville, 25 2 Epsa.
* Point Clear, 50 3 Mobile.

ARIZONA.

639 Bowie Station. 660 Canon Diablo. 669 Holbrook.
669 Winslow.
* Pinal, 10 4 (30 2 N. M. rate) Casa Grande.
* Silver King 50 4 (30 2 N. M. rate) Casa Grande.

ARKANSAS.

449 Brentwood. 391 Jacksonport. 449 West Fork.

CALIFORNIA.

827 Albion Mills. 800 Ocean View. 826 Table Bluff.
700 Decoto. 720 San Geronimo. 847 Whiteboro.
799 Norman Station.
* Midwell's Bridge, 25 2 by telephone, Greenville.
* Lafayette, 15 2 by telephone, Martinez.
* Walnut Creek, 15 2 by telephone, Martinez.

COLORADO.

646 Agate. 541 First View. 545 Orchard.
565 Boreas. 546 Godfrey. 587 Red Cliff.
623 Browns Canon. 548 Hardin. 634 Rockwood.
640 Buffalo, Weld Co. 590 Holleys. 628 Sargents.
623 Calumet. 599 Hortense. 558 South Pueblo,
552 Carr. 623 Hot Springs. Ok. Pueblo.
545 Deuel. 614 Ignacio. 592 Timpas.
559 Earle. 640 Lift.
* Rock Springs 65 4 Plattsmouth, Neb.

CONNECTICUT.

35 Hop River.
* Bridgewater, 20 0 by telephone, New Milford.
* Naubuo, 30 3 Hartford.
* Noroton, 10 0 by telephone, Stamford.
* Warren, 20 0 by telephone, New Milford.
* Whitneyville, 50 0 New Haven.
* Winnipauk, 10 0 by telephone, Norwalk.

DAKOTA.

846 Big Stone City. 890 Hillsboro. 926 Miller.
940 Canning. 924 Hitchcock. 894 Montrose.
916 Chamberlain. 947 Houston. 920 Northville.
947 Dickinson. 896 Kindred. 916 Ordway.
938 Eagle Nest. 896 Mayville. 903 Preston.
913 Eldridge.

* Crook City, 50 2 by telephone, Deadwood.
* Pine Ridge Agency, 150 3 Cheyenne Wy.
* Rosebud Agency, 175 10 Cheyenne Wy.
* Spear Fish, 50 2 by telephone, Deadwood.
* Sturgis City, 50 2 by telephone, Deadwood.

DELAWARE.

FLORIDA.

* Blue Pond, 75 5, (50 3 N. M. rate) Lake City
* Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
* Highland, 80 4 Lake City.
* Paola, (N. M.) 100 6 Lake City.
* Perry Junction, 75 5, (50 3 N. M. rate) Lake City.
* Tocoi, (N. M.) 50 3 Lake City.
* Waits Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

207 Dubois. 187 Folkston. 246 Roswell.
246 East Point. 186 Perkins Junc.
* Abbeville (N. M.) 40 3 Ft. Gaines.
* Arlington, 40 3 Ft. Gaines.
* Blakely, 40 3 Ft. Gaines.
* Senola, (N. M.), 25 2 Newnan.

IDAHO.

578 Arimo. 970 Dry Lake. 970 Rathdrum.
970 Ocoana Lake.

ILLINOIS.

316 Algonquin. 298 Bonfield. 309 Montrose, Effing-
300 Allendale. 327 Brockbridge. ham Co.
307 Alpine. 307 Dummer. 307 New Lebanon.
316 Annawan. 346 Forrester Junc. 347 Oakford.
328 Beecher City. 318 Gays. 318 Stockton.
Effingham Co. 3-6 Lanark Junc. 346 Union Grove.
329 Belknap. 307 Mannheim.

INDIANA.

252 Briant. 298 Lowell. 290 Parton.
300 Cynthiana. 262 Milroy. 294 Rose Lawn.
2-0 English Lake. 280 Monon. 271 Sedalia.
300 Ingles. 300 Owensville. 253 Westport.
268 Letts Corner. 261 Oslan.
* Ferdinand. By mail, Ferdinand Station.
* Elkhart, free, by telephone, Dana.
* St. Meinrad. By mail, Ferdinand Station.

IOWA.

387 Ashton. 426 Irvington. 346 Riggs, Ok. Pres-
346 Browns, Ok. Pres-416 Kamrar-
ton.
387 Buffalo. 454 Irwin. 426 Rutland.
426 Dakota City. 445 Kirkman. 473 Calif.
367 Donahue, Ok. 388 La Orew. Ok. 367 Sand Spring, Ok.
Dixon. Hamill.
367 Fairport. 435 Lake City. 416 Thor.
435 Farnhamville. 407 Laurel. 4-7 Van Cleave.
416 Galt. 397 Libertyville. 417 Van Wert.
407 Girard. 435 Lohrville. 367 Viola, Ok. Stone
425 Hardy. 367 Montpelier. City.
416 Harcourt. 455 North Boro. 425 West Bend.
426 Herndon. 416 Pilot Mound. 425 Willow Glen.
417 Polo.

KANSAS.

517 Alum Creek. 527 Collyer. 527 Lenora.
456 Argentine. 503 Crawford. 448 Mulberry Grove.
466 Barclay. 527 Edmond. 518 Valley Center.
521 Chase. 514 Galva. 475 Wakarusa.
527 Cleveland. 507 Hazelton. 466 Westphalia.
517 Clifton. 508 Horton.
* Cottonwood Falls, 50 0 Cottonwood.
* Enterprise, 15 0, by telephone, Detroit.

KENTUCKY.

263 Bloomfield. 263 Finchville. 283 Rocky Hill.
268 Crescent Hill. 243 Pine Hill. 263 Taylorsville.
* Clay Lick, 25 1 by telephone, Worthville.
* Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Hunting-
ton, W. Va.
* Eastern Junc., 50 3 Lexington, Ky., or 35 2 Hunting-
ton, W. Va.
* East Ky. Junc., 35 2 Huntington, W. Va.
* Flemingsburg, 15 2 by telephone, Johnson Junc.
* Gistville, 25 1 by telephone, Worthville.
* Grats, 25 1 by telephone, Worthville.
* Kilgore, 30 3 Huntington, W. Va.
* Lockport, 25 1 by telephone, Worthville.
* Marion, 15 1 by telephone, Worthville.
* Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington,
W. Va.
* Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W.
Va.
* Pine Grove, 50 3 Huntington, W. Va.
* Port Riffe, 25 1 by telephone, Worthville.
* Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
* Springport, 20 1 by telephone, Worthville.

LOUISIANA.

424 Eola. 424 Mermentau. 423 Robeline.
424 Garland. 385 Mounds Sta. 442 San Patrice.
442 Gloster. 442 Pleasant Hill. 442 Stonewall.
442 Grand Cane. 423 Provence. 444 Whitesville.
354 Lockout.

* Millikens Bend (N. M.), 40 3 Tallulah.
* Plaquemine, 50 3 New Orleans.
* St. James, 50 3 New Orleans.
* Vacherie, 50 3 New Orleans.

MAINE.

4 Presque Isle.

MARYLAND.

85 Ashland. 77 Marlboro. 54 Pocomoke Sta-
77 Bowie. 67 Octorara. tion Ok. Poko-
67 Edgewood. 85 Odenton. smoke City.
85 Lutherville. 54 Peninsular Junc.
* Hyattsville, 25 2 Baltimore, Md., or Washington, D. C.

MASSACHUSETTS.

86 Conway. 21 Wellesley Hills. 12 W. Harwich. Ok.
28 Otter River. Dennisport.
* Asylum Sta., 75 0 Danvers.
* Bass River Harbor, free by telephone, So. Dennis.
* Ocohesett, 25 0 by telephone, East Bridgewater.
* Collins' Mills, Dracut, 15 1 by telephone, Lowell.
* Danvers Centre, 25 0 Danvers.
* Danvers Insane Hospital, free by telephone, Danvers.
* Danversport, 25 0 Danvers.
* Dracut Navy Yard, 15 1 by telephone, Lowell.
* Forge Village, 15 1 by telephone, Lowell.
* Gardner, 15 0 Gardner Depot.
* Grantville, 15 1 by telephone, Lowell.
* Hyannisport, 15 0 by telephone, Hyannis.
* Lunenburg, 10 0 by telephone, Fitchburg.
* Mattfeld, 50 0 East Bridgewater.
* Melrose Highlands, 25 0 Melrose.
* Middlesex Village 15 1 by telephone, Lowell.
* No. Middleboro, 150 0 Middleboro.
* Phenix Village, Tewksbury, 15 1 by telephone, Lowell.
* Rock, 150 0 Middleboro.
* South Bitterica, 15 1 by telephone, Lowell.
* So. Gardner, 15 0 Gardner Depot.
* South Mills, 10 0 by telephone, New Bedford.
* Weentham, 35 0 by telephone, Providence, R. I.
* West Bridgewater, 15 0 by telephone, East Bridgewater.
* W. Chelmsford, 15 1 by telephone, Lowell.
* W. Danvers, 150 0 Danvers.
* Westford, 25 0, Westford Depot.
* Westford Depot, 15 1 by telephone, Lowell.
* West Gardner, 15 0 Gardner Depot.

MEXICO.

* Paso del Norte, 05 0 El Paso, Tex.

MICHIGAN.

188 Beaver Lake. 119 Free Soil. 127 Mullet Lake.
230 Beech. 187 Hobart. 231 North M. remat.
251 Bridge water. 127 Indian River. 267 Shelbyville.
211 Britton. 281 Jerome. 127 Topinabee.
210 Brockway Centre 19 Manistee Junc. 127 Vanderbita.
250 Orapo. 210 Marlette. 100 Wetzell.
210 Fostoria. 210 Mayville. 127 Wolverine.
127 Freedom. 260 Moline.
* Flushing, 15 0 by telephone, Flint.

MINNESOTA.

190 Argyle. 865 Minnetonka. 869 Rock Island Quar-
865 Arlington. 865 Minnetonka Mills. ry.
875 Buffalo Lake. 867 Mission Creek. 892 Slayton
889 Kennedy. 890 Muskoda. 876 Vernon Centre.
861 Minnehaha. 870 Osawa. 865 Waconia.
863 Winthrop.

* Currie, 25 2 Tracy.

MISSISSIPPI.

361 Courtland. 363 Morton.
* Arcola, 85 6 Vicksburg.
* Johnsonville, 85 6 Vicksburg.
* Stoneville, 85 6 Vicksburg.

MISSOURI.

457 Ellis. 426 Montserrat. 398 Shelbyville, Ok.
369 Eliah. Shebina.
* Augusta, By mail, Labadie.
* Greenfield, 50 0 So. Greenfield.
* Fardin, 25 2 Unionville.

MONTANA.

967 Iron Butte. 583 Melrose. 957 Terry.
966 Keith. 583 Silver Bow Junc.

NEBRASKA.

947 Atkinson. 927 Inman. 923 Long Pine.
538 Chappell. 614 Gilmore. 927 Stuart.
922 Clear Water.

* Benkeman, (N. M.), 60 4 Plattsmouth.
* Burchard, (N. M.), 35 2 Plattsmouth.
* Liberty, (N. M.), 55 2 Plattsmouth.

NEW BRUNSWICK.

3 Albert. 3 Lake Ha Ha. 3 St. Louis
3 Carleton Sta.
* Port Egin, 25 2, Sackville.

NEVADA.

676 Luning. 676 Soda Springs.

NEW HAMPSHIRE.

20 Livermore.
* Chesterfield, 25 0 by telephone, Brattleboro, Vt.
* Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
* North Hinsdale, 20 0 by telephone, Brattleboro, Vt.

NEW JERSEY.

41 Brick Church. 41 Centerville, Pas- 47 Magnolia
Tariff same as said Co. 52 Valley.
Orange. 47 Clementon. 41 Wayne.
63 Cedar Brook.

NEW MEXICO.

559 Blossburg. 637 Coolidge. 632 Monero.
566 Corralos. 637 Gallup. 630 San Antonio.
569 Dillon Junc. 638 Lava. 636 Upham.
* Fort Stanton, 25 3 San Marcial.

NEW YORK.

64 Albion station. 51 Fish's Eddy, Del- 74 Scriba.
Oswego Co. Ok. aware Co. 44 Tramblyers Iron
Sand Bank. 64 Manneville. Works.
65 Apalachin. 83 Nichols. 65 Vestal.
46 Cornwall on Hud- 83 North Lansing. 46 Walkhill.
son. 51 Rockland. 46 Wicopee Junc.
* Minisink, Orange Co., 15 1 Fort Jervis.

NORTH CAROLINA.

305 Alexanders. 178 Newton. 144 Rowan Mills.
125 Laurel Hill.
* Falkland, 25 2 (25 1 N. M. rate), Tarboro.
* Pactolus, 40 3 (30 2 N. M. rate), Tarboro.

NOVA SCOTIA.

2 Albion Mines. 2 Sherbrooke.
* Baddeck, 25 2 North Sydney.
* Ingonish, 25 2 North Sydney.

OHIO.

221 Alvada. 180 Fair Grounds. 232 Osgood Sta.
281 Alvorston. 204 Hadley Junction. 252 St. Johns.
170 Barton. 221 Luckey. 159 Strasburg, Stark
151 Brilliant. 221 McComb. Co.
180 Creston. 221 Moore. 218 Storms.
180 Everett, Summit 180 New Berlin, Stark 215 Wheelersburg.
Co.
* De Kalb, 25 2 Mansfield.
* Hartsville, 15 1, Minerva.
* Hayesville, Ashland Co., 15 1 by telephone, Ashland.
* Middle Branch, 15 1, Minerva.
* Mogadore, 15 1, Minerva.
* Monroe Centre, 20 3 No. Kingsville.
* New Hazelton, 15 1, Minerva.
* North Benton, 25 2 Braceville.
* Osnaburg, 15 1, Minerva.
* Pierpont, 25 2 No. Kingsville.
* Poland, free by telephone, Youngstown.
* Red Lion, 15 1 by telephone, Franklin.
* Robertsville, 15 1, Minerva.
* Sherrodsdale, 15 1, Minerva.

OREGON.

795 Beaverton. 795 Whites.
785 Cascade Incline.

- Airline (N. M.), 50 P. Portland.
- Blue Mountain, 50 5 by telephone, Walla Walla, W. T.
- Fort Klamath, 50 3, Ashland.
- Linkville, 50 3, Ashland.
- Milton, 50 5 by telephone, Walla Walla, W. T.
- Weston, 50 5 by telephone, Walla Walla, W. T.

PENNSYLVANIA.

- 84 An's Fort. 181 June Bug 111 Songbird.
- 180 Clarendon Depot. 94 Lewistown June. 140 R. & A. Junction.
- 140 Corsica. 140 Lucinda Station. Ch. Mercer.
- 52 Cresco, Monroe 59 Lusk, Ch. Nor. 131 Wernerville.
- 58 Dunmore. Ch. 84 Mainville 130 Thompsons, Warren Co.
- 172 Kirk Lick. 140 Mount-In-Grove. 180 Union City Depot
- 181 Etta, Allegheny 54 Rowland's. Mowlem.
- 140 Evansburg, But. 111 St. Thomas. 140 Volant.
- 181 Fallston. 59 Shady, tariff 180 Waterford Depot.
- 84 Georgetown. same as Quaker- 181 Wilkinsburg.
- 59 Gibraltar Ch. town, Ch. Qua- 161 Willow Grove, Allegheny Co.
- 180 Sheffield Depot. 140 Wilmington
- 59 Honey Brook. 84 Snyderstown 140 Zellenopie.
- 93 Jackson Summit.

- Academy Corners, 15 1 by telephone, Lawrenceville
- Alma House, 10 1 Allentown.
- Balliettsville, 10 1 Allentown.
- Best sta, 10 1 Allentown.
- Centre Point, 10 1 Allentown.
- Centerville, Elk Co., free, by telephone, cabonda.
- Churchville Berks Co. 10 1 Allentown.
- Clayton, 10 1 Allentown.
- Cornling, 10 1 Allentown.
- Cowanesque Valley, 20 1 by telephone, Lawrenceville.
- Dillingersville, 10 1 Allentown.
- Elmer, 30 1 by telephone, Lawrenceville.
- Eagleville, 10 1 Allentown.
- Fairview, Montgomery Co., 10 1 Allentown.
- Fagleyville, 10 1 Allentown.
- Franklin, Lehigh Co., 10 1 Allentown.
- Gilbertsville, 10 1 Allentown.
- Harrison Valley, 20 1 by telephone Lawrenceville.
- Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.
- Ironton, 10 1 Allentown.
- Limerick Square, 10 1 Allentown.
- Lower Milford, 10 1 Allentown.
- Neffs, 10 1 Allentown.
- Nelapa, 10 1 by telephone, Lawrenceville.
- New Berlin, 10 1 Allentown.
- Pleasant Corner, 10 1 Allentown.
- R. d. Hill, 10 1 Allentown.
- Richaville, 10 1 Allentown.
- Saegerville, 10 1 Allentown.
- Schneeksville, 10 1 Allentown.
- Statedale, 10 1 Allentown.
- Trappe, 10 1 Allentown.
- W. Milton 26 1 Milton.
- Yellow House, 10 1 Allentown.
- Zionsville sta, 10 1 Allentown.

QUEBEC.

- Beauve June. Hulets Landing.
- Buiver. St. Alphonse de la Grand
- Buiva. Boia.
- Amherst Harbor, Magdalen Islands, 75 5 No. Sydney N.E.
- Etang du Nord, Magdalen Islands, 75 5 No. Sydney, N. S.
- Grosse Is. Magdalen Islands, 75 5 North Sydney, N. S.
- House Harbor, Magdalen Islands, 75 5 No. Sydney, N. S.

SOUTH CAROLINA.

- 146 Jacksonboro. 146 Ravenels.
- 292 Bellevue. 292 White Bluffs. 34) Witha.
- 183 Union Depot. 2.5 Whitesburg.

TEXAS.

- 657 Albany. 495 Cuero (South). 657 Sierra Blanca (So.)
- 651 Alexander. 480 Forest. 648 Trinity Mills
- 656 Antelope (South). 654 Latam (South). 470 Wayne.
- 479 Bagwells. 470 Lodi. 500 West.
- 657 Boracho (South). 655 Metz (South). 657 Wildhorse (South)
- 653 Bremen. 499 Marzaret. 483 Winona.
- 657 Carlos Pass (So.). 654 Ojessa (South). 459 Wharton.
- 495 Clear Creek. 656 San Martin (So.)
- Aguilares, 50 3 Corpus Christi.
- Benavides, 40 3 Corpus Christi.
- Kounts, 35 2 Beaumont.
- Los Angeles, 50 3 Corpus Christi.
- Pena, 40 3 Corpus Christi.
- Realitos, 40 3 Corpus Christi.
- Salado, 40 3, Austin.
- San Diego, 40 3 Corpus Christi.
- Village, 40 2 Beaumont.

VERMONT.

- 27 Miles Pond. Ch. et. 81 Pompanoosuc.
- Johnsbury. 39 South Wallingford.
- 27 Passumpsic.
- E. Rupert, 15 2 Factory Point.
- Guilford, 10 0 by telephone, Brattleboro.
- Hartwellville, 20 1 by telephone, No. Adams, Mass.
- Jacksonville, 25 2 by telephone, No. Adams, Mass.
- North Stamford, 15 1 by telephone, No. Adams, Mass.
- Readsboro, 20 1 by telephone, No. Adams, Mass.
- Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
- Sedawga, 25 2 by telephone, No. Adams, Mass.
- Stamford, 15 1 by telephone, No. Adams, Mass.
- Wells, 15 2 Factory Point.
- West Dover, 25 0 by telephone, Brattleboro.
- Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

- 123 Afton. 162 New River Depot. 163 Roanoke.
- 185 Clifton Forge. 93 Pl ina.
- Lairds, (N. M.), 40 3 Richmond.
- Lee Hall, 30 2 Richmond.

- New Market, Nelson Co., (N. M.) 25 2 Richmond.
- Salisbury, (N. M.), 40 3 Richmond.
- Yorktown, 45 3 Richmond.

WASHINGTON TERRITORY.

- 7-4 Carbonado. 722 So Texas. 784 White River.
- 774 Skagit City. 788 Touchet.

WEST VIRGINIA.

- Coalmont, (N. M.) 30 2 Greenbrier, W. S. Spgs. or 45 3 Huntington.
- Talcott, (N. M.) 25 2 Greenbrier, W. S. Spgs. or 50 3 Huntington.

WISCONSIN.

- 345 Barneveld. 325 Jefferson June. 325 Sullivan.
- 304 Calhoun. 354 Livingston. 351 Superior June.
- 325 Cottage Grove. 325 London. 350 Summit Lake.
- 304 Dousman. 306 No. Greenfield. 350 Tunnel City.
- 352 Hayward. 347 Audolph. 355 Turtle Lake.
- 359 Kemper. 306 Spring Meadow. 306 Wa. ea.
- Sturgeon Bay Canal, 25 2 Horns Pier.
- St. Josephs Pier, 25 2 Horns Pier.

WYOMING.

NORVIN GREEN,

President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, Feb. 27, 1882.

To all Transfer Agents and offices.

The transfer service has been resumed at Bowling Green, Ky., and temporarily discontinued at Jeffersonville, Ind.

On March 1, 1882, Minneapolis, Minn., will be added to the list of transfer offices in Class A 2, and assigned to I. McMichael's district.

On March 15, 1882, Auburn, N. Y., will be advanced from Class B to Class A, 2.

NORVIN GREEN,

President.

A DANGEROUS TENDENCY IN SCIENCE.

Mr. W. Spottiswoode, in his president's address before the Royal Society, has sounded the note of alarm against an evil that has begun to affect science, and may result in harm if it grows. Research, he suggests, is being drawn into the hurry that characterizes other departments of life in our generation, and the glamour of sensational fame is too apt to blind the eye to the light of the solid honor which is the real and best reward of science. "Apart from other reasons, the difficulty, already great and always rapidly increasing, of ascertaining what is actually new in natural science; the liability at any moment of being anticipated by others, constantly present to the minds of those to whom priority is of serious importance; the desire to achieve something striking, either in principle or in mere illustration—all tend to disturb the even flow of scientific research. And it is, perhaps, not too much to say that an eagerness to outstrip others rather than to advance knowledge, and a struggle for relative rather than absolute progress, are among the most dangerous tendencies peculiar to the period in which we live." Happily, this tendency has not yet become general in science, and Mr. Spottiswoode's calling attention to it may go far toward providing a cure for it.

A NEW PHOTOMETRIC UNIT.

In an original paper by Prof. John O. Draper he proposes a new photometric unit. He objects to the standard candle on the ground that candles can never be made that will possess exactly the same composition, on which account the light emitted from the candle used as standard for comparison will necessarily vary slightly with the same consumption, thus vitiating the result. He suggests as a substitute for the standard candle, the light emitted by an

incandescent solid—a coil of platinum of given gauge and surface, maintained at a constant temperature. An incandescent solid will emit a definite and constant amount of light at certain temperatures, and it is only necessary to provide for maintaining the uniformity of the temperature in order to be assured that the light emitted is constant. To accomplish this, Prof. Draper proposes to allow a flame of pure dry hydrogen, burning at a definite rate, to strike upon the platinum coil; and he found that so long as wire of the same diameter was made up into coils of the same dimensions, and these were subjected to a flame of hydrogen burning at the same rate, the light emitted by the glowing wire was of the same intensity. There is no difficulty in maintaining a constant and uniform consumption of hydrogen, while with an electric current there would be great difficulty in maintaining its uniformity.

WANTED

By an OPERATOR a situation in Telegraph Office, B. R. office preferred. References given.
Address TELEGRAPH OPERATOR,
(Bennington Co.) Barnumville, Vt.

GREAT REDUCTION

IN
P I C E S
OF

PINS & BRACKETS.

WE ARE NOW PREPARED TO FURNISH

- Pins Plain.....\$10.00 per thousand.
- Pins Painted..... 11.00 " "
- Brackets Plain..... 13.00 " "
- Brackets Painted..... 15.00 " "

Best quality of Oak. Special Discount on large orders.

L. B. HARRIS,

MANCHESTER, N. H.

Paraffine Oils and Wax.

Prepared especially

FOR ELECTRICAL PURPOSES,

Without Acids or Alkali.

STEVENSON, BRO. & CO.,

No. 132 So. Second St., Philadelphia, Pa.

THE
BROOK'S PATENT INSULATORS
WERE AWARDED
THE FIRST PREMIUM

At the Paris Exposition of 1877
At the Vienna Exposition, 1874.
At the Cincinnati Industrial Exposition in 1876.
And at the Centennial Exposition at Philadelphia in 1876.

MANUFACTURED AND FOR SALE BY
DAVID BROOKS,

92 North 21st Street, Philadelphia.

Operators' Cramps cured by



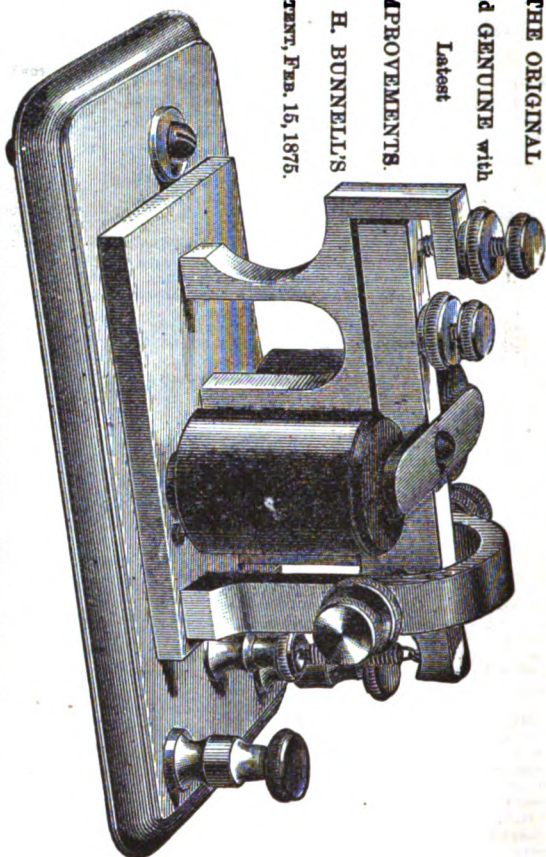
J. H. BUNNELL & CO.'S FIRST CLASS TELEGRAPH MACHINERY.

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS.

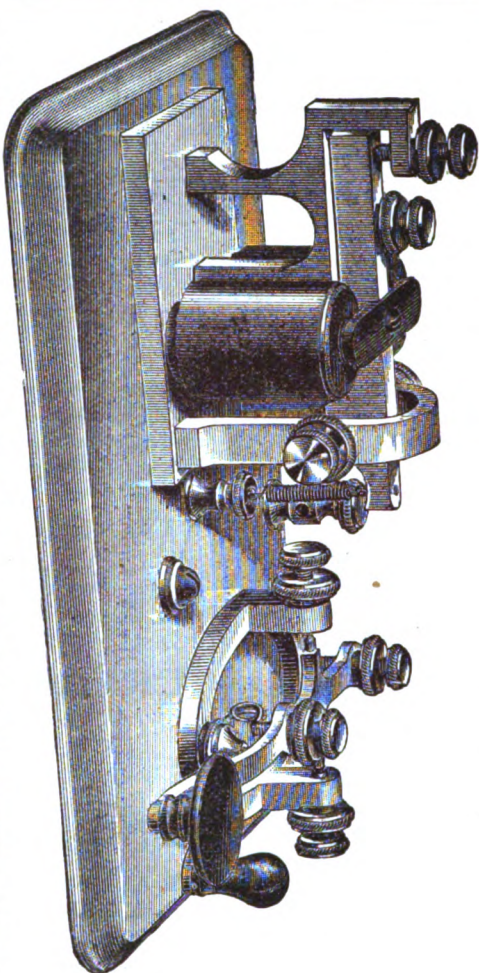
J. H. BUNNELL'S

PATENT, FEB. 16, 1875.



THE GIANT SOUNDER—UNEQUALLED!

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$6.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



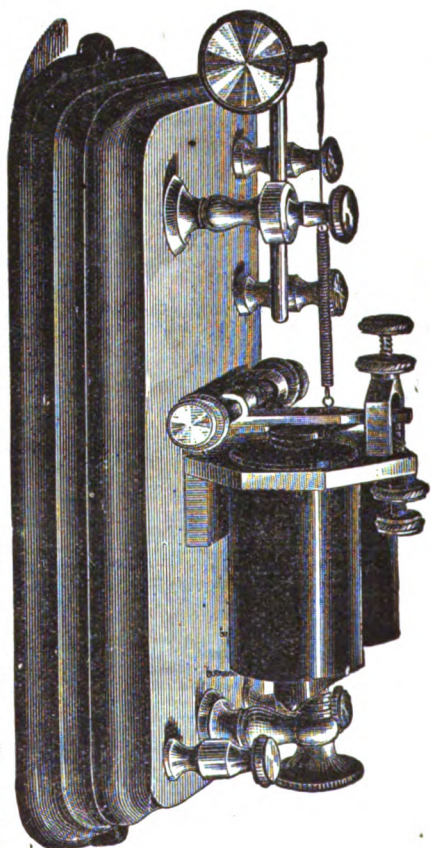
GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET:

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$8.00, carefully boxed and sent by mail, prepaid, to any part of the United States.

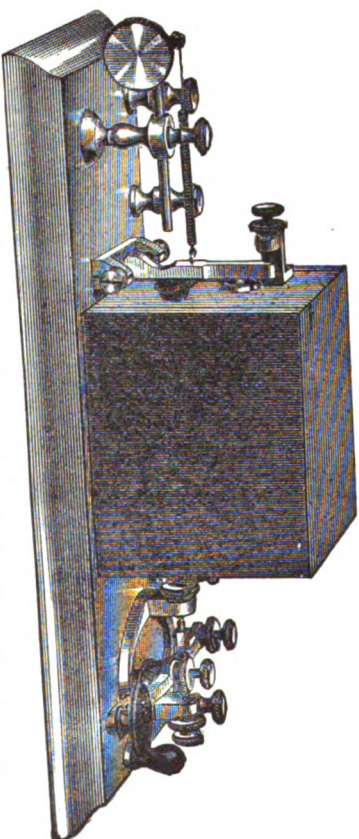
All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.



FIRST-CLASS MAIN LINE RELAYS. [WESTERN UNION STANDARD.]

100 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Surface, Extension Adjustment. Price, \$8.50.



BOX SOUNDING RELAY AND STEEL LEVER KEY.

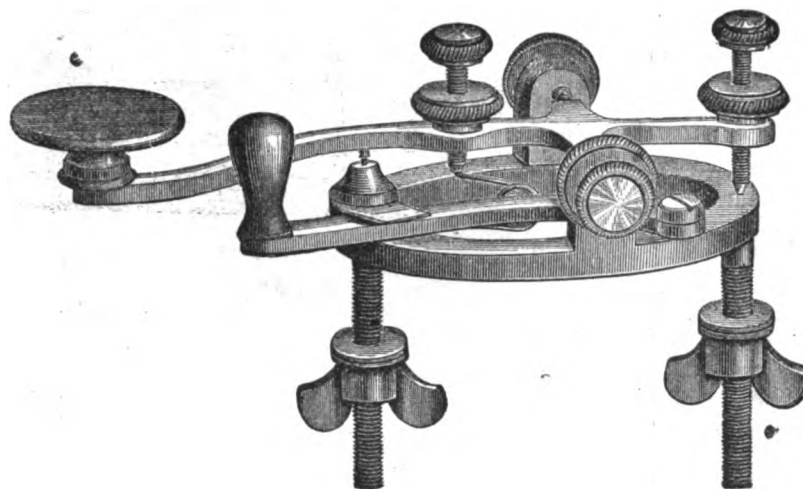
COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$12.00; without Key, \$9.00.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:

The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

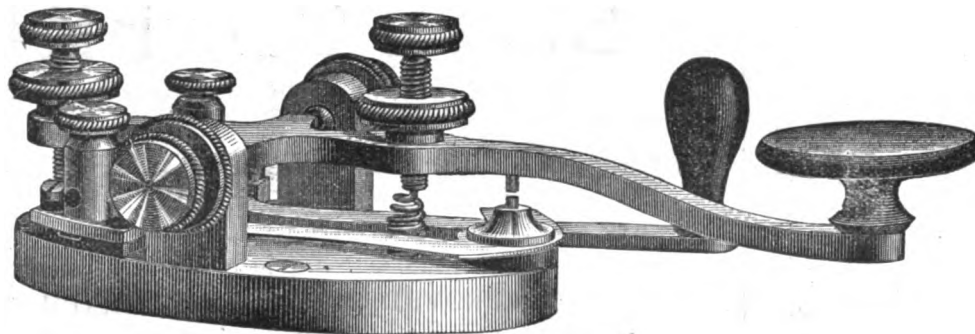
The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Legless Pattern Steel Lever Key.



A BEAUTIFUL AND PERFECT KEY,

Suitable for Use on Fine Desks, or Wherever a Legless Key is Preferable.

PRICE, Carefully boxed, and sent, prepaid, by mail to any part of the United States, • **\$4.00.**

J. H. BUNNELL & CO., 112 LIBERTY STREET, NEW YORK.

CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells, District Bells and Switches for Exchanges, Annunciators, etc

TELEGRAPH & ELECTRICAL INSTRUMENTS,

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

GEO. WHITINGHOUSE, Jr. Pres. RAYMOND BASSETT, V. Pres. & Treas.
O. H. JACKSON, Gen'l Manager. ASAPH T. BOWMAN, Secretary.
HENRY SWINDELL, General Agent.

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of
The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
sole Owners and Manufacturers of the only practically successful

SYSTEM OF OPERATING RAILROAD SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches, signals and Gates by Levers, Hydraulics, Pneumatics or Electricity.

Also, Manufacturers of Frogs, Crossings, Switches and Switch Stands.

Plans, estimates and detailed descriptions, together with references to apparatus in practical operation, will be furnished upon application.

ESTABLISHED 1820.

ALFRED F. MOORE,

[Successor of JOSEPH MOORE & SONS]

MANUFACTURERS OF

INSULATED TELEGRAPH WIRES,

200 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

INSTRUMENT AND OFFICE WIRES. FLEXIBLE CORDS. ANNUNCIATORS
AND BURGLAR ALARM WIRES. ELEVATOR CABLES.

All wire used is thoroughly tested for conductivity therefore ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP,

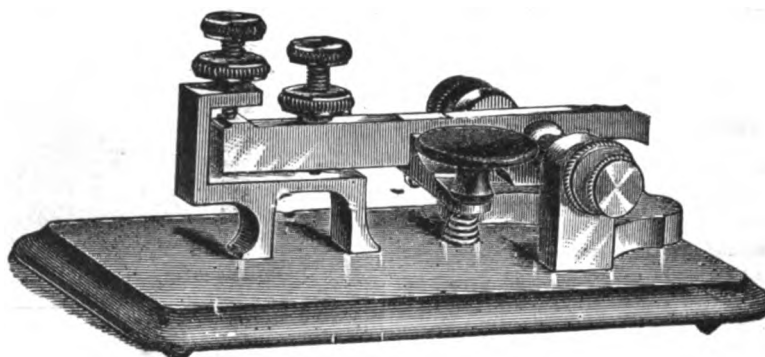
FOR FLEXIBLE CORDS

Descriptive Circulars furnished upon application.

NEW MECHANICAL

TELEGRAPH INSTRUMENT.

PATENT APPLIED FOR.



COMBINED KEY AND SOUNDER.

NO BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is always ready for use.

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or registered letter.

J. H. BUNNELL & CO.,

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

ILLUSTRATED CATALOGUES

OF NOVEMBER, 1881?

If not, send your address by postal card or letter and you will get one by return mail

IT CONTAINS

Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instruments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

Don't Read This!

Or you will BE SURE to send for our NEW 1882 CATALOGUE, which is proper and to your interest to do before purchasing elsewhere. IF you want to be a TELEGRAPH OPERATOR send twenty-five cents for our NEW 1882 ILLUSTRATED INSTRUCTION BOOK. It is the MOST COMPLETE instruction book in the world. C. E. JONES & BRO.: Dear Sirs:—Instruction Book received. O. K., and many thanks. It is worth five times what it cost. If a person could not learn to be an operator after studying it, they had better give up. Yours truly, A. L. JAMES, Tipton, Tulare County, Cal.

Now! Right Now! while fresh in your mind, is the best time to send your order, before you misplace this paper and forget our address, and your opportunity is gone. Remittances preferred in currency, 1c. or 2c. stamps.

C. E. JONES & BRO.,

MANUFACTURERS AND DEALERS IN

TELEGRAPH, TELEPHONE AND ELECTRICAL SUPPLIES.

NO. 51 WEST FOURTH STREET, CINCINNATI, OHIO.

WESTERN ELECTRIC MANUFACTURING COMPANY.

220-222 KIRKIN STREET, CHICAGO.

62-68 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES,

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, M-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

AMSON STAGER, President. ERNEST M. BARTON, V.-Pres.

ELLEN GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE. |
|---|--------|--------|
| I—Complete Set of Catalogues..... | 296 | 20c. |
| II—Telegraph Instruments and Supplies | 64 | 6c. |
| IV—Insulated Wire (included in II). | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 28 | 2c. |
| VI—Electro-Medical Apparatus..... | 28 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 28 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 2c. |
| XI—Magnets for Mills..... | 20 | 2c. |
| See Wm. Thomson's Nautical Instruments.... | 24 | 6c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,

AND

PLAIN AND OILED WIRE OF SUPERIOR QUALITY,

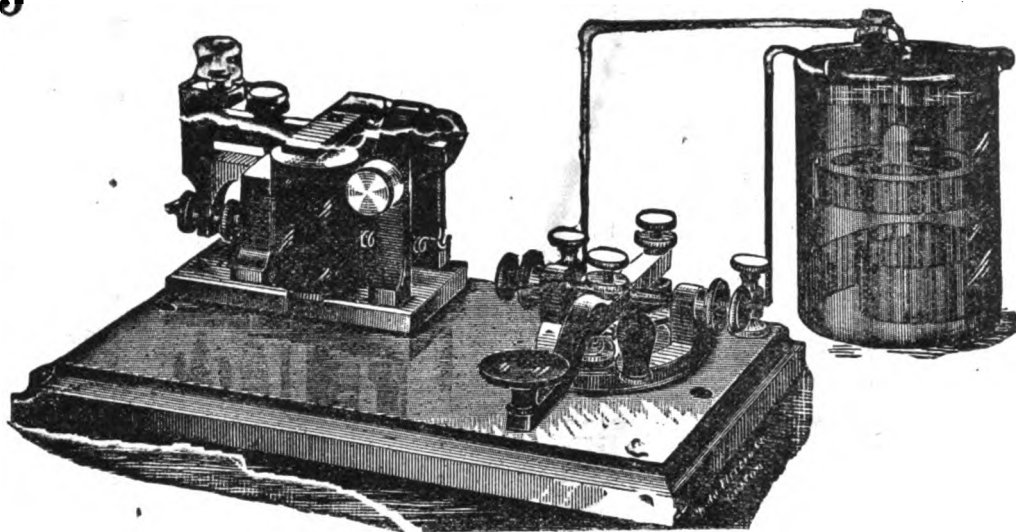
FROM SWEDISH CHARCOAL AND B B IRON.

SUT ONE JOINT PER BUNDLE.

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



PRICE FOR THE COMPLETE "GEM" LEARNERS' OUTFIT, \$4.20.

Consisting of the above large-sized Sounder and Key, a good Cell of Callaud Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instruments made that has nicely finished brass Sounder and Key Levers with perfect adjustments for both.*

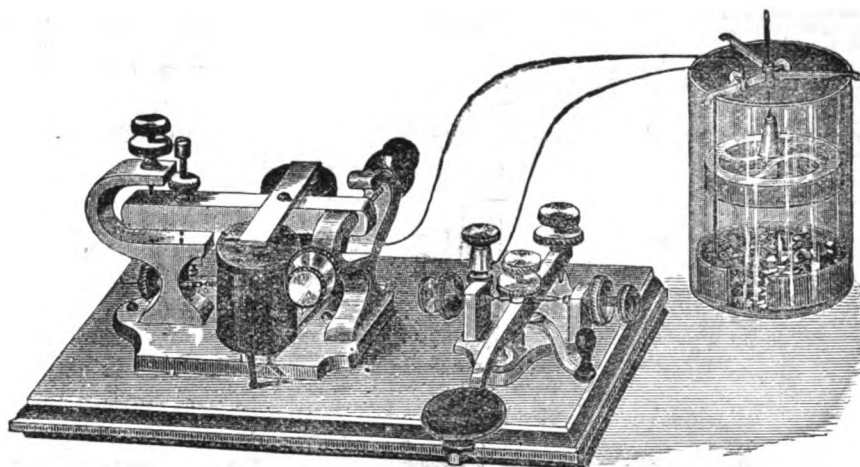
| | | |
|---|--------|--|
| Price for Complete Outfit..... | \$4.20 | Price for Instrument alone, for 1 to 15 miles...\$4.00 |
| " " Instrument alone | 2.40 | " " " " " " |
| " " Instrument alone, by mail, postpaid ... | 4.00 | by mail, postpaid..... 4.5 |

SEND FOR CIRCULAR.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,

No. 80 HANOVER STREET, BOSTON, MASS.



No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of: Sounder, Key, either on 1 base or separate, 5x7, Callaud Battery, Book of Instructions, 15 feet of office wire, 1 pound vitriol. These are a perfect success, sent O. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

A. B. LYMAN, 36 South Water St., Cleveland, O.

PARTRICK & CARTER

TELEGRAPHIC SPECIALTIES.

THE GIANT SOUNDER PERFECTED.

Patented Feb. 16, 1875. Most perfect, reliable, clear toned; fine finish, and warranted the best working sounder in existence. Price, by mail, \$5.00.

THE "LATTIG" AUXILIARY LEVER NON-STICKING KEY.

PATENTED AUGUST 16, 1881. PRICE, \$5.00, BY MAIL.

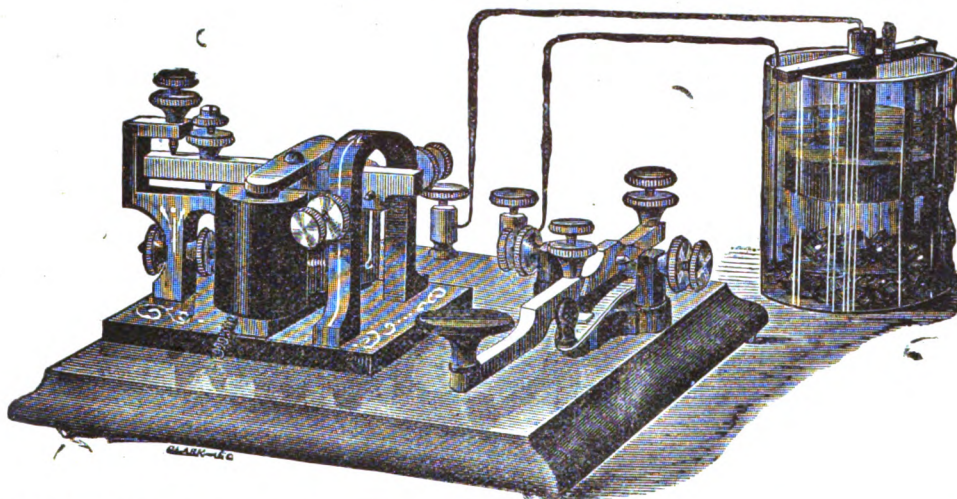
This Key is very fine finish nickel-plated, and presents a beautiful appearance, is easy to handle and WARRANTED NEVER TO STICK. It has been extensively tried and has received the endorsement of the best operators in the country. It embodies the only true principle to prevent a Key from sticking by having a great separation between the anvil and hammer, (without increasing the play of the Key lever), thereby preventing the formation of the "Electrical Arc" between the platina points, which is the PRIMARY CAUSE OF STICKING KEYS. We claim this Key will never fail to make contact.

"THE EXCELSIOR KEY." (PATENT APPLIED FOR.) PRICE \$2.50 BY MAIL.

This Key is made ENTIRELY OF BRASS NICKEL PLATED, with hardened platina points, and it is put forward to meet the long existing demand for a CHEAP, LIGHT, EASY WORKING, FIRST CLASS KEY, and is without doubt the CHEAPEST and BEST Key EVER OFFERED FOR THE MONEY.

Premium Learners' Apparatus.

Only \$5.00. Not the Cheapest, but Guaranteed the Best.



The PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER, PERFECTED," and "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Galland Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5.00, when the money accompanies the order. The great number of these Instruments use is the best testimonial that can be offered.

Price, Complete Outfit.....Money in advance, \$5.00

" Instrument without Battery....." " 4.20

" Instrument without Battery, by Mail....." " 4.75

Remittances should be made by P. O. Money Order, Registered Letter, Draft or Express, which will insure safe delivery. Send for circulars.

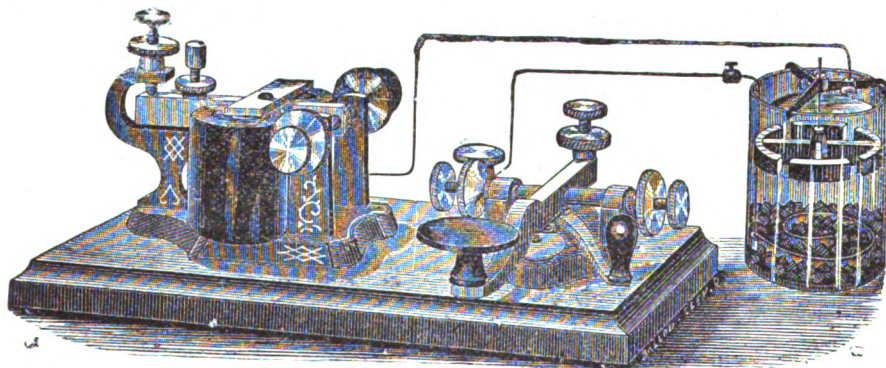
PARTRICK & CARTER,

No. 114 SOUTH SECOND STREET, PHILADELPHIA, PA.,

Manufacturers and Dealers in TELEGRAPH, TELEPHONE, AND ELECTRICAL INSTRUMENTS AND SUPPLIES OF EVERY DESCRIPTION. Send for Catalogues and Circulars.

SEND FOR OUR PRICES BEFORE PURCHASING ELSEWHERE.

EUREKA OUTFIT NO. 2.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

THE ABOVE OUTFIT AND MATERIAL ALL COMPLETE SENT ON RECEIPT OF \$4.25.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

Room 19, Leader Building, Cleveland,

TELEGRAPHERS' MUTUAL

BENEFIT ASSOCIATION.

2,164 MEMBERS. \$21,640 RESERVE FUND.

The Association respectfully invites attention to its success during the past ten years, having paid to its beneficiaries over \$175,000, and accumulated a reserve fund of \$21,640, interest upon which nearly pays current annual expenses. No officer or agent draws salary or commission. Average annual assessments to each member has been less than \$12.

Any person, of either sex, in good health of not less than 18 or more than 45 years of age, who is employed in telegraphic service, and is otherwise qualified as required by the By-Laws, is eligible to membership; and should a member in good standing leave the Telegraphic Service, but continue to pay all dues assessed and otherwise conform to the Constitution and By-Laws, he can retain his membership.

The initiation fee is \$2. \$1,000 will be paid to the beneficiary of a deceased member within 60 days after verification of claim; and in the case of a member who has been one year, — next preceding date of death — in good standing the claim is indisputable.

Any one who is or becomes a member in good standing of this Association is also eligible to membership in the new or Second Division. For further information, copies of Constitution and By-Laws, blank applications, etc., apply to any of the following named officers or agents:

OFFICERS:

CLARENCE CARY, President. O. H. SUMMER, Vice-President.
A. R. BREWER, Secretary. SAMUEL M. TAYLOR, Treasurer.

EXECUTIVE COMMITTEE:

CLARENCE CARY, New York. O. H. SUMMER, Chicago, Ill.
A. R. BREWER, New York. SAMUEL M. TAYLOR, New York.
W. H. YOUNG, Wash'ton, D. C. F. W. JONES, New York.
JOHN E. ZIEGLIN, Phil. Pa. CHARLES S. H. SMALL, New York.
JAMES MERRIHEW, New York.

AUDITING COMMITTEE:

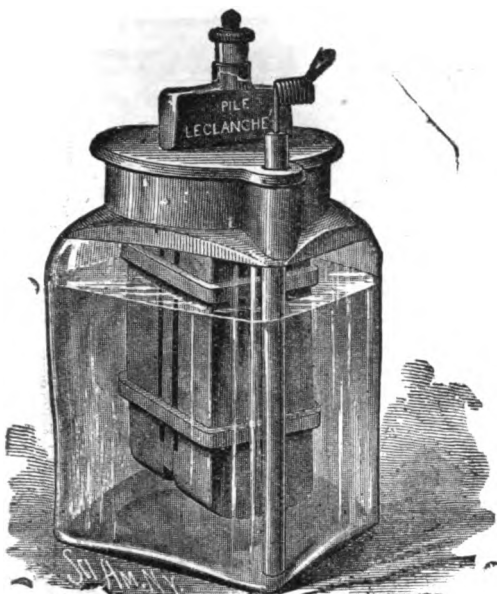
H. C. ROBINSON, Philadelphia, Pa. T. P. SOULLY, New York.
R. W. POPE, New York.

AGENTS:

| | |
|--|---------------------|
| Albany, N. Y. | Charles C. King. |
| Augusta, Ga. | John W. Brown. |
| Atlanta, Ga. | J. M. Stephens. |
| Baltimore, Md. | R. J. Bloxham. |
| Bangor, Me. | O. E. Bliss. |
| Bismarck, Dak. | Chas. E. V. Draper. |
| Boston, Mass. | E. B. Pillsbury. |
| Buffalo, N. Y. | J. W. Tillinghast. |
| Cheyenne, Wyo. Ter. | Chas. F. Annett. |
| Cincinnati, Ohio. | G. W. Sheppard. |
| Chattanooga, Tenn. | Charles H. Skelton. |
| Charleston, S. C. | J. D. Easterlin. |
| Chicago, Ill. | J. Uhrig. |
| Cleveland, Ohio. | H. L. Melton. |
| Columbus, Ohio. | C. W. Ross. |
| Denver, Col. | W. B. Rundle. |
| Dubuque, Iowa. | F. I. Benson. |
| Detroit, Mich. | T. W. Hill. |
| Elkhart, Ind. | S. P. Wilcox. |
| Evansville, Ind. | N. M. Booth. |
| Grand Rapids, Mich. | E. D. Benedict. |
| Galveston, Texas. | David Hall. |
| Grafton, W. Va. | A. T. Oline. |
| Harrisburg, Pa. | H. A. Oline. |
| Halifax, N. S. | Alex. E. Hoyt. |
| Hartford, Conn. | S. E. Curtis. |
| Indianapolis, Ind. | F. A. Moore. |
| Jackson, Mich. | D. S. Fleming. |
| Jackson, Tenn. | Nelson E. Jacobs. |
| Kansas City, Mo. | M. D. Wood. |
| La Fayette, Ind. | H. E. Doolittle. |
| Little Rock, Ark. | E. C. Newton. |
| Louisville, Ky. | Charles Smith. |
| Mobile, Ala. | B. P. Shreve. |
| Montgomery, Ala. | B. Winter. |
| Memphis, Tenn. | H. E. Conley. |
| Milwaukee, Wis. | D. H. Hennessy. |
| Montreal, Quebec. | James Kent. |
| Nashville, Tenn. | A. H. Stewart. |
| New Haven, Conn. | J. M. Fairchild. |
| New Orleans, La. | J. T. Allyn. |
| No. Sydney, O. B. | Nathl Martell. |
| New London, Conn. | G. W. Russell. |
| N. Y., L. Erie & W. B. E. (21 Cortlandt St. N. Y.) | O. D. Reed. |
| Oil City, Pa. | Frank Ross. |
| Omaha, Neb. | L. M. Rheem. |
| Philadelphia, Pa. | Wm. G. Jones. |
| Phillipsburgh, N. J. | G. H. Grace. |
| Peoria, Ill. | J. B. Hammatt. |
| Pennacola, Fla. | O. L. Le Baron. |
| Pittsburgh, Pa. | J. E. Palmer. |
| Poughkeepsie, N. Y. | S. K. Bupley. |
| Portland, Me. | O. D. Livermore. |
| Portland, Oregon. | D. F. Leahy. |
| Providence, R. I. | Jas. S. Hall. |
| Reading, Pa. | W. H. Bunyeon. |
| Richmond, Va. | W. O. Walstrum. |
| Rochester, N. Y. | A. J. Stoddard. |
| Reno, Nevada. | Frank H. Macdonell. |
| Sayre, Pa. | H. H. Hamilton. |
| Scranton, Pa. | R. O'Brien. |
| Syracuse, N. Y. | Luther G. Field. |
| St. John, N. B. | B. T. Clinch. |
| St. Louis, Mo. | Geo. W. Brownson. |
| St. Paul, Minn. | Day E. Smith. |
| San Francisco, Cal. | A. P. Dubois. |
| Savannah, Ga. | H. Griffith. |
| Springfield, Mass. | W. J. Denver. |
| Springfield, Ill. | W. W. Kelchme. |
| Toronto, Ont. | J. Lanskill. |
| Troy, N. Y. | F. D. Adams. |
| Toledo, Ohio. | J. P. Church. |
| Vincennes, Ind. | Perry Hood. |
| Washington, D. C. | W. H. Young. |
| Wheeling, W. Va. | Jno. G. Tomlinson. |
| White River Junction, Vt. | G. W. Gates. |
| Wellsville, Ohio. | P. Bruner. |
| Worcester, Mass. | E. W. Bradford. |
| Watertown, N. Y. | D. Van Nostrand. |

A. R. BREWER, Sec'y.

P. O. Box 3175. New York,
W. U. T. BUILDING, Room 68,

LECLANCHE BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE

American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company,
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones.

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Flaccques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

REMARKS ON IMPROVEMENTS AND WORKING INSTRUCTIONS.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity
Sine and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,

40 West 18th St., New York.

Or L. G. TILLOTSON & CO.,

5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT PRISMS

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLES, ETC.

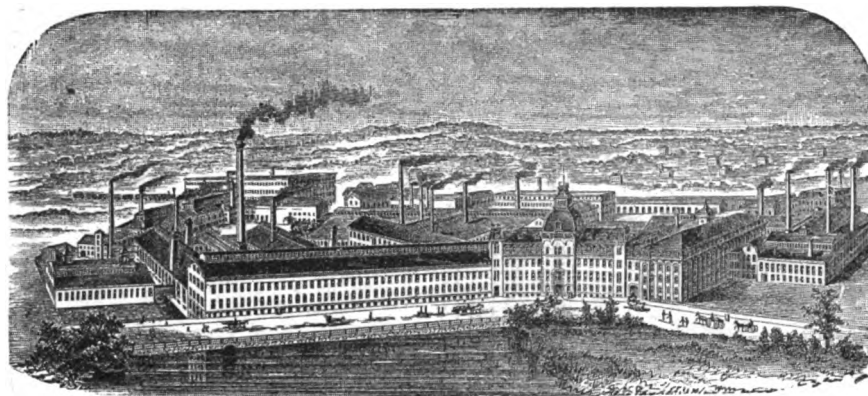
OFFICE AND FACTORY: 67 STEWART STREET,

PROVIDENCE, R. I.

W. H. SAWYER, Electrician and Supl.

TELEGRAPH WIRE.**WASHBURN & MOEN MANUFACTURING COMPANY.**

ESTABLISHED 1851. CAPITAL \$1,500,000.



WORCESTER, MASS.

21 CLIFF STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to *highest electric conductivity*, does not hesitate to recommend this class of its products as unequaled in that particular.
(Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

(In connection with the DOUGLAS ROLLING FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

R. R.—The qualities known as Extra Best Best (R. R. B.) and Best Best (R. B.), kept constantly in stock.

KERITE INSULATED**TELEGRAPH WIRES AND CABLES**

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession

THE

DURABLE QUALITIES OF KERITE

RECORDED IN AS THE

CHEAPEST AND MOST ECONOMICAL

insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation furnished at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

Further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

J. B. HOSCHKE, General Agent.

TELEPHONE WIRE.**THE AMERICAN
BELL TELEPHONE COMPANY.**

W. H. FORBES, President, W. K. DRIVER, Treasurer,

THEO. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

In all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

The "Morse" Learners' Instrument.

THE BEST.

THE "MORSE"

Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

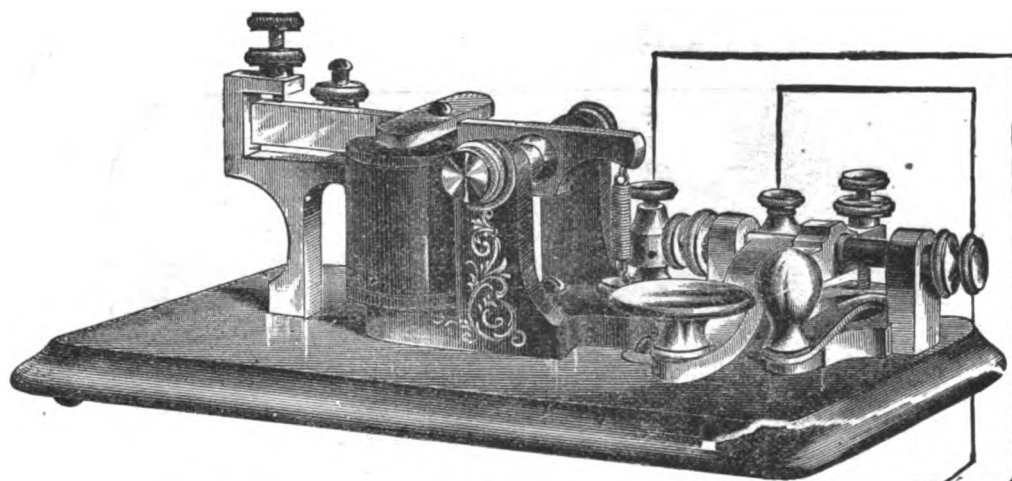
It is the best working set of Learners' Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

You are SURE of getting THE BEST THAT IS MADE

IF YOU SELECT THE "MORSE."

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.



THE BEST.

Price, \$450, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.

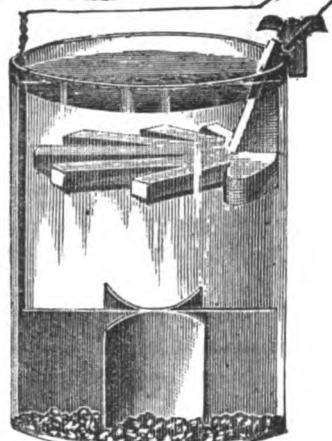
"Morse" instrument alone, without battery..... \$3.80
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 4.50
 Cell of battery complete..... .65
 "Morse" Learners' Instrument, without battery, sent by mail..... 4.30

(Battery cannot be sent by mail.)

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.



YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "73," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 either designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys, Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents;

also Embellished Keys 25 for 25 cents. Samples of Operators' Cards 10 cents. 50 New and laughable Illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 20c. 25 side-spitting Comic Cards, 2c. Morocco card cases, two pockets, 10c. 100 finely printed letter heads, \$1.00. 100 extra 10c. envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 10c. Agents Wanted to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also sat n fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and Slipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200, no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from 3 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,

F. P. MUNN, CLYDE, Wayne Co., N. Y.

WESTERN UNION TELEGRAPH COMPANY,
 NEW YORK, December 14, 1881.
 DIVIDEND No. 58.

The Board of Directors have declared a quarterly dividend of ONE AND ONE-HALF PER CENT. upon the capital stock of this company from the net revenues of the three months ending December 31st, instant, payable at the office of the Treasurer on and after the 16th day of January next, to shareholders of record on the 20th day of December, instant.

The transfer books will be closed at three o'clock on the afternoon of the 20th of December, instant, and re-opened on the morning of the 17th of January next.

R. E. ROCHESPER, Treasurer.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
 With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.

GEO. B. FULLER,
 Successor to Dr. D. BLY, Rochester, N. Y.

BEST TELEPHONE EXCHANGE SWITCH BOARD.

IN THE WORLD.

SUPERSEDING ALL OTHERS.

Sample and Circulars sent to Exchanges on

Application to

C. E. JONES & BRO.,

CINCINNATI, OHIO.

WESTERN SCHOOL OF TELEGRAPHY.

JANESVILLE, WISCONSIN.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement, now of eight years standing, with the system of city lines in Chicago known as the Metropolitan Telegraph Company, having over 100 offices, and worked in connection with the Western Union Telegraph Company. These city lines draw their operators from this school, placing them first in sending offices and afterwards promoting them according to merit. The superintendents of telegraph of the different railroads centering at Chicago, employ many men from the city lines, and the Western Union Company does the same, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make of our students first class operators, nor to obtain for them first class situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

ROBERT VALENTINE, } MANAGER.
 A. M. VALENTINE, }

N. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have lately furnished the following Companies in this way: Wisconsin Central, Green Bay & Minn.; St. Paul, Minneapolis, & Manitoba & Chicago; St. Paul, M. & Omaha; and Burlington & Northwestern.

We can so furnish, on short notice, experienced operators competent to manage any ordinary office, and reliable in every respect.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, MARCH 20 1882.

WHOLE NO. 345.

MAGNETIC DISTURBANCES, AURORAS, AND EARTH CURRENTS.*

By PROF. W. GYLLS ADAMS, F. R. S.

(Continued from page 67.)

Now in what way can we account for such magnetic disturbances as this? If we assume that by magnetic induction from some cause or other the earth's magnetism is altered, then the position of the magnet which would produce the disturbance must be such that its pole which attracts the marked end of our needle must lie at the beginning of the disturbance to the east of Kew and Lisbon, to the north of Vienna, and to the northwest of St. Petersburg; the Lisbon vertical force curve also shows it to be below the surface of the earth. Hence an inductive action equivalent to a change of position of the north magnetic pole toward the geographical pole would account for these changes. The strengthening and weakening of a magnet with its north pole to the north on the meridian of Vienna might possibly account for the magnetic changes observed between 9.30 and 10.30 at night, Greenwich time, on March 15, 1879.

If we attempt to explain this disturbance by currents of electricity or discharges of statical electricity in the air above the needles, then we must imagine that at first there is a strong current from the southwest over St. Petersburg, from the west over Vienna, and from the northwest over Kew and Lisbon, the vertical force needle at Lisbon showing that the current from the northwest lies somewhat to the east of Lisbon, that at the Mauritius this current is from the north, and at Bombay from the south.

Hence we must imagine that a current of electricity passes down from northwest to the south-east, going on toward the east, over Vienna, and towards the northeast over St. Petersburg. This must be kept up very much along the same line throughout the first part of the disturbance, and then the current or currents must be altered in strength in the same manner at all stations.

We will next consider what would hardly be called a magnetic storm, but a few very small deviations of the magnetic needle, lasting from about 5.30 to 7.30 P. M. on March 26, 1879. Only the comparison of the originals will give the closeness of the similarity of the curves, and the curves for Vienna and Kew are absolutely coincident.

When the declination needle is deflected to the west, the horizontal force needle is deflected with its marked end toward the south, so that in this disturbance the two needles are drawn toward the southwest at the same time with greater or less power, and twelve similar bends are clearly traced out in the Vienna and Kew curves during the two

hours. These disturbances are all so very small, that but for the comparison of photographs they would probably be lost sight of; yet we see that the same deflections occur at the same instant at Kew and at Vienna, at St. Petersburg and at Melbourne. From the remarkable similarity in these disturbances and their occurrence at the same time, we should expect that the cause of disturbance is so far removed from the places of observation that the difference of their distances from it need not be considered. This might not unreasonably be urged as an argument in support of a theory that such disturbances are due directly to the action of the sun regarded as a magnetic body. The numerical comparisons of observations made every five minutes on certain days previously fixed upon would probably never have shown the way in which these minute changes of magnetic power of the earth at widely distant places are related to one another.

In one or two cases Senor Capello and Prof. Balfour Stewart had compared the Lisbon and Kew curves for a particular disturbance, but the photographic magnetic records have never before been collected from other stations, and there has been no opportunity of comparing them. From the precise similarity of the forms of the curves in many cases we may say that the rate of change of magnetic disturbances at widely distant stations is the same. There is nothing fitful or flashing in such disturbances as these of March 26. We might imagine a current in the crust of the earth or a current or transfer of electricity in the air near to, i. e., within twenty or thirty miles of each of these observatories, but to imagine the same current and the same variations of the current at so many different stations, all changing in the same way at the same instant, is difficult, unless it can be shown in what way all these changes are connected with the cause of such a regular electric discharge. It seems easier to imagine that such changes as these are due to a change produced by induction in the magnetism of the earth itself by some distant body. It is easy to show that the magnetism produced by a current in a magnetic substance round which it flows is greater in its action on a small magnetic needle than the direct action of the current itself. Hence a current flowing in the crust of the earth should produce its principal effect on a magnetic needle by the magnetic induction which the current induces in the earth itself.

Sometimes disturbances occur where at the same instant there are similar deflections of the declination needles at stations wide apart, and suddenly at one of the stations the needle no longer goes with the others, but begins to go, and continues for a considerable period to go, in the opposite direction to the others, turning when they turn, and tracing out a similar curve, but turned always in the opposite direction. Such cases occurred frequently during March, 1879, and especially on March 23, about 1.30 and about 7 P. M., Kew time, and on March

29, about 9 P. M. An examination of the principal disturbances seems to show that:

(1) A diminution in the horizontal force is accompanied by greater easterly deflections of the declination needle at St. Petersburg than at Kew.

(2) Increase of the horizontal force is accompanied by greater westerly deflections at St. Petersburg than at Kew, or is sometimes accompanied by a westerly deflection at St. Petersburg and an easterly deflection at Kew.

These cases which I have taken will be sufficient to show how important it is that there should be additional magnetic observatories, especially in the southern hemisphere, where photographic records should be taken, so that we may learn something about the magnetism of the earth. Practically we have to rely on one excellent observatory (Melbourne) for the whole of the southern hemisphere. Surely the time has arrived when there should be photographic registration of the magnetic element at such an important observatory as the Cape of Good Hope, especially when the French Government has decided within the last few weeks to establish a magnetic observatory at Cape Horn. With observatories at Melbourne, at Cape Horn, and at the Cape of Good Hope, the southern hemisphere would be well supplied, and probably the Russian Government would then soon establish an observatory in the east of Siberia.

Now we can readily show the way in which the magnetic instruments are disturbed in a magnetic observatory by the alteration of the strength of a magnet. Taking magnetic needles to represent the declination needle, the inclination needle, and the bifilar or horizontal force needle, we may place an electro-magnet in a given position with regard to them, and by altering the strength of that electro-magnet may cause these needles to trace out disturbances of a very decided character. In the disturbance of March 26 the greatest motion of the needle was not more than about 2° of angle at Kew or at Vienna. It would not be possible for me to show you the action on so small a scale.

I have as yet been speaking of only moderate disturbances, but now let us come to some of the larger ones, and I have had the opportunity, through the kindness of the Kew Committee, and the observers at the various observatories mentioned, of studying the curves for the August magnetic storm which began at 10.20 A. M., Greenwich time, on August 11, and for convenience may be divided into three storms, one lasting from 10.20 on the 11th, to 1 A. M. on the 12th; a second from 11.30 A. M. on the 12th to 7.20 on the 13th; and the third from 11.50 A. M. on the 13th to 7 to 8 A. M. on the 14th of August.

I have prepared a large sheet, on which these curves have been copied as accurately as possible for the first of these storms on the 11th. For this storm I have also the curves from Toronto and from Zi-ka-wei. The first storm began on August 11 at

* Lecture delivered at the Royal Institution, June 2, 1881.—*Nature*.

the same instant at all the stations. There is a decided similarity, especially in the horizontal force curves, throughout the first part of this storm, and certain points in it stand out prominently. At Kew the beginning of the storm is not actually recorded because the sheets of prepared paper on the time cylinders were changed at precisely 10.20 A. M., when the storm was beginning. The deflections are alike at Lisbon, Kew, Vienna, St. Petersburg, and after the very first sudden deflection, at Toronto also. The greatest effect is produced at St. Petersburg; the similarity between the large disturbances at Vienna and at Toronto in Canada, places differing about 6½ hours in time, is remarkable. About 11.45, 1 P. M., and 2.40 P. M., there are very remarkable points of agreement.

From about 4.30 P. M. to 8 P. M. Greenwich time, i. e., from about 11 A. M. to 2.30 P. M., Toronto time, the deflections are opposed at Toronto, and at Vienna or Kew.

This would rather point to solar action as the cause of disturbance. In this case the Kew curve is not so much deflected as the Vienna curve, because the horizontal needle at Kew is not nearly so sensitive as at Vienna, and the relative strengths of the actual disturbing forces at the two places can only be obtained by comparison of the scale-values at two places.

I will draw your attention to one other point on this day. At 9 P. M. the disturbances are all in the same direction, but about 11 P. M., while St. Petersburg agrees in direction with the others in a very violent phase of the storm, at Toronto the direction of the deflections is reversed, and this reversal continues until about the end of the first of the three storms.

The second storm, beginning about 11.30 A. M. on the 12th, and lasting until the next morning, was the most remarkable of the three. It not only baffles the telegraph clerks, who wish to keep out earth currents from their lines, but it even goes beyond the powers of the magnetic observatories which are specially designed to watch over them. Thus, at Toronto, the line goes off the edge of the paper on which the photographic record is taken. At Melbourne the motion is so rapid, and also at Vienna, that the place is not sensitive enough to receive the impressions; the motion is too quick even for photography. At the time of greatest disturbance, about 12.20 midday, it is very remarkable that at Lisbon, and at Zi-ka-wei, near Shanghai, in China, two places nearly in the same latitude, but nearly nine hours apart in time, the vertical force is increased in precisely the same way and to the same amount at the same instant.

At Zi-ka-wei, in China, the sudden change in the horizontal force on the needle amounted to about one one-hundredth part of the total horizontal force, and at St. Petersburg the change in the horizontal force amounted to one thirty-fifth part of the horizontal force, and the total force was changed by about one-eightieth part of its full value.

Hence, any cause for these magnetic changes, in order to be a true and sufficient one, must be capable of producing such intense magnetic changes as these all over the surface of the earth. These magnetic changes are so large as to be quite comparable, as we see, with the earth's total force, so that any cause which is shown to be incompetent from the nature of things to produce the one can hardly be held to account for the other.

Since, as I have shown, the large disturbances and the small disturbances do not follow totally different laws, but agree equally well all over the earth, in so far as they agree we must attribute them to the same cause.

During this August storm, as also during the remarkable storm of January 31 last, great difficulties were experienced in working the telegraph lines, and Mr. Preece has been kind enough to send me particulars of these storms.

I am also greatly indebted to the Astronomer-Royal for sending me traces of the earth-current photographic records taken at Greenwich Observatory during the August storm on two separate wires, one running from the northeast, and the other from the southeast, to Greenwich. The two tracings are bent opposite ways at the same time, so that when a current was running on one line toward Greenwich, on the other it was running away from it; and comparing these curves with the earth-current records from Derby and Haverfordwest and other places, it appears that the general direction of currents during this storm was from southwest to northeast, or from south-southwest to north-northeast, with varying intensity, the agreement being very close between the disturbances of the declination needle and the Blackheath and Greenwich photographic record. From Mr. Preece's record also earth-currents were violent from 10.30 A. M. on the 11th (i. e., they were noted within ten minutes of the beginning of the magnetic storm) to about 2.30 P. M., and again from 9 to midnight.

(To be continued.)

REVOLVING TELEGRAPH TABLE.

THE engraving shows an improved revolving telegraph table patented by Mr. John L. Garber, of Greenville, Ohio. The table is divided by glass partitions into a series of sub-divisions for the several sets of instruments. Each compartment of the table requires four strips or rings of metal around the central post, a separate insulated wire leading from each ring to their respective instruments on the table, the wire being placed in a shallow groove directly back of the rings and metal collar. The central post revolves in the central hollow leg of the table, and the hollow leg is provided with a series of contact springs, consisting of a segmental plate attached to a counter-sunk stem fitting into a socket and pressed against the plates or rings of the central post by a spiral spring, these contact springs or their sockets are connected with the local battery or main line. To the under side of the table is fastened a perforated ring, into the aperture of which a vertical locking bar fits, which is pressed upward by a suitable spring, and can be withdrawn by depressing a foot lever on the under side of the base frame of the table.

For conveniently illuminating the different sections of the table a lamp or gas burner is mounted at the intersection of the glass partition of the table. When the operator wishes to use any certain set of instruments he depresses the foot lever, which permits the table to be turned until the desired set of

instruments is in front of the operator, who does not leave his seat. The foot lever being released the table is locked in position. This table may be arranged for two, three or more sets of instruments, the number of rings and contact springs varying accordingly.

The advantages of this device will be apparent to telegraphic engineers and operators. The removal or insertion of switch plugs or the turning of switches is entirely avoided, the necessary changes being made automatically as the table is turned.

The inventor has also arranged his table for Edison's Electric Light, and as the electric light is rapidly taking the place of gas, this feature will be duly appreciated.

The space occupied is nearly one hundred per cent. less than when a common four instrument table is used, only one chair being required and table being more compact.

When one man works three or more wires he can handle much more business, and with two of these tables, he can work eight wires without leaving his chair.

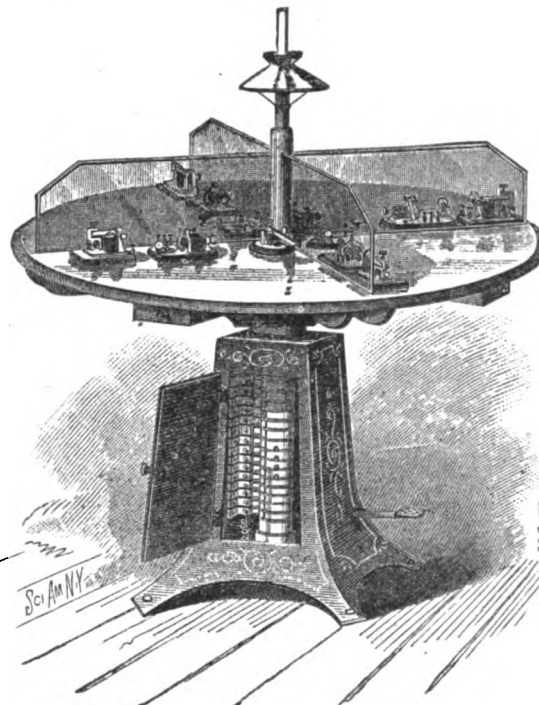
Mr. Garber is manager of the Western Union Telegraph office at Greenville, Ohio, where he has had one of his tables in use for the past four months.

The table, besides being so convenient, is very beautiful.

LECTURES ON ELECTRICITY AT THE CRYSTAL PALACE.

PROFESSOR Sylvanus Thompson, of Bristol, lectured recently at the Crystal Palace on "Electric Currents: What are they?" This lecture, the first of a series which the directors of the Palace have organized in connection with the International Exhibition of Electricity, was delivered in the concert room.

The lecturer began with an enumeration of the multifarious services now rendered to mankind by the electric current, such as the ringing of bells, the giving of signals, the transmission of messages by telegraph, and the giving of light. Yet, though its applications were endless, it was remarkable how little was known of its intimate nature. To understand the true nature of electric currents, or even of electricity itself, necessitated a wide range of study, the more careful because of the great variety in the different properties and phenomena. Electricity might remain in the



GARBER'S REVOLVING TELEGRAPH TABLE.

form of "charges" on the surface of bodies, or might flow through their substance in continuous "currents." Yet it was not a material fluid, and the term "electric fluid" was now only used by those who knew nothing about modern investigations in the science. Nevertheless, a study of the various properties of electricity, the attractions and repulsions it set up, the sparks to which it gave rise, the chemical decompositions it

affected, the magnetic actions it produced, all led toward a certain theory, only to be grasped when all these diverging lines were traced back to their logical origin. It was a matter of congratulation that so many eager and able scientists were now devoting themselves to this youngest of the sciences, more especially as it was pre-eminently a British science. Almost every great discovery in electricity has been made by Englishmen. From the time of Dr. Gilbert, who founded the science in 1600, Englishmen had been foremost in electric discovery. Boyle, Hawksbee, Sir Isaac Newton, were among the foremost investigators. Stephen Gray discovered that electricity could be made to flow in currents through wires.

John Canton discovered the influence exerted by electricity at a distance; Benjamin Franklin, the inventor of the lightning rod, was a Briton, though resident then in Philadelphia; Humphrey Davy, the discoverer of the electric light; Spencer, the inventor of electro-plating; Faraday, the greatest experimentalist in electric science that ever lived, to whose fundamental discoveries modern dynamo-electric machinery may be directly traced; Ronalds, Cooke and Wheatstone, the fathers of the electric telegraph, and Swan, the inventor of the Carbon filament lamp, were all Englishmen, while Graham Bell the perfecter of the telephone, was Briton-born. Not that some great discoveries had not come from other lands. Ounsius, a Dutchman, discovered the Leyden jar; Volta, an Italian, discovered the Voltaic cell; Oersted, a Dane, discovered the relation between magnets and electric currents; Reis, a German, invented the first rude telephone by which articulate speech was transmitted; and Planté, a Frenchman, invented the storage battery or accumulator. Professor Thompson described the production of electricity by means of friction, showing the action not only of frictional machines, but of machines on the inductive principle. He pointed out the gradual development of voltaic electricity, from Volta's pile to Daniell's, Groves' and Bunsen's cells, at the same time directing attention to the costly method of producing the current by the consumption of zinc. As an illustration he explained the theoretic work obtained by the consumption of 1 oz. of various kinds of fuel, thus:

| | |
|--------------------------|----------------------|
| 1 oz. of Coal gives..... | 695,000 foot-pounds. |
| " Gunpowder gives... | 100 000 " " |
| " Zinc gives.... | 113,000 " " |
| " Copper gives..... | 69 000 " " |
| " Hydrogen gives..... | 2,925 000 " " |

After thus referring to the relation between the power of electric currents and the power that is spent in producing them, Professor Thompson spoke of the certainty that in the near future all heavy mechanical work would be done by electric currents in the place of steam, a theme which will claim further attention in a subsequent lecture. Developing the question of the production of electric currents in voltaic batteries, the lecturer referred to the discovery that such batteries were reversible, and that in this reversibility lay the newly-discovered power of storing or accumulating electric energy in cells which could be charged and discharged at pleasure. The magnetic and thermal properties of the electric current were illustrated experimentally, the lecturer remarking, with much emphasis, about the physiological properties that the mistake of confounding these with medical or remedial effects led to the gross impositions of the quacks and rogues who deal in so-called magnetic appliances, and disgrace alike the sciences of electricity and of medicine, while knowing nothing of either.

The nature of electric currents was reverted to, and an outline was given of the theory of Clerk

Maxwell that all electric phenomena were due to actions going on in the thin medium that fills the whole universe—the *æther*—vibrations of which are light and heat, the accumulations of which are electric charges, the streams in which are electric currents, and which, where it was made to spin round in vortices or whirlpools gave rise to magnetic attractions. In conclusion the lecturer commented on the immense importance of the revolution now beginning in the substitution of electric machinery for steam engines, and urged that if England desired to reap the benefit of this impending reorganization of the methods of mechanical production, if she desired that her workmen should rise to the immense future before them, she must not lose an hour in providing them with an education in matters electrical, seeing that a knowledge of electric currents and their properties will be of far more practical importance than a knowledge of any other branch of science. If technical education did not come in any other way, it would be forced upon us by the practical fact that electricity is to be our servant in the place of steam and of coal.

THE CENTRAL TELEPHONE OFFICE IN PARIS.

The Paris Telephone Company have now got their new central office in the Avenue de l'Opéra into full working order, and it contains one of the most extensive and complete telephonic installations to be found (in any one office) in Europe.

Upon entering from the street what was once a shop is occupied as an office for the public, where they can get every information as to the facilities offered by the company and inspect models of every description of instrument and material used in carrying out the system; immediately behind this is situated the telephone office itself and downstairs is the commutator room and other necessary dependencies.

The wires are laid by the French state telegraph administration in the sewers; they are laid up in cables each containing seven circuits of two wires, and each pair is easily recognized by being covered with cotton of a different color from the others; each of these cables is enclosed in lead according to the well-known French plan.

250 cables as described, furnishing 1,760 circuits, are led from the street into the underground floor of the office and are carried to six gigantic commutator boards arranged in two sets of three each; these are each of some eight feet high by six feet broad, and are of the dial or *rosasse* pattern adopted by the French telegraph administration, each *rosasse* accommodating 42 cables or 294 circuits. Each cable is numbered and its wires are led to a similarly numbered group of 14 (two for each circuit) binding screws placed on the circumference of the commutator, which are permanently connected with 14 other binding screws directly in front of them, and from which depart corresponding wires leading directly upstairs to the telephone room; each set is carefully marked with the name and office number of the subscriber using them.

In the system adopted all the outlying or district offices, of which there are eight situated in different parts of the city, communicate directly and permanently with each other by such a number of wires as correspond to their respective wants; and although these through wires are brought into the station in the Avenue de l'Opéra, they do not in any way afford communication with that office, but are carried directly to one of the large commutators we have mentioned, from where they again leave the building by corresponding sets of cables that run to the respec-

tive district offices. These commutators, although accommodating each as many as 294 circuits, or 568 arrival and as many departure wires, are excessively simple and handy. No plugs are used, but any necessary changes are instantly effected by merely removing the wires from one binding screw to another.

Behind the commutator room is the battery room, in which are the cells used for working the call bells and the transmitting microphones that are upstairs. The *Leclanché*, with large bent zinc plates, is the form used; they stand on glass tables. Each call bell has eight cells, and each microphone four, but only two of them are in service at a time, the other two resting idle to recover the effects of polarization. The telephone office upstairs is a long room divided longitudinally by two sets of commutator boards running nearly from end to end, and placed back to back, with an interval of some three feet between them so as to allow easy access to, and free inspection of, all the connections necessary to establish the communications carried out on the front of the board. Each of these boards is divided into twenty-one panels, each of which accommodates twenty-five subscribers. The calls are arranged on the well-known American system: the number of the calling subscriber is exhibited by the current releasing a small metal flap which when down closes the circuit of a local bell; the clerk on duty puts himself in speaking communication by inserting a jack-knife plug into the corresponding numbered hole in the commutator lying immediately under the calls; having ascertained the number of the subscriber the first caller wishes to communicate with, the clerk puts them into direct communication by two jack-knife plugs connected by a wire, inserted in the respective numbers on the commutator. In the case of the two subscribers not being on the same group of twenty-five on the board resource is had to a Swiss commutator, which is placed directly under each panel and by which communication is made from any one number in one group to any number in another. The two long commutators we have described as standing back to back are considered as two entirely independent stations, and any communications necessary to be established between them are carried out by telephone and a series of connecting wires as if they were miles apart. The center group of twenty-five numbers in each board is exclusively used to make connections between the two boards; doing this is, however, avoided as much as possible by so grouping together the subscribers on the boards that their respective numbers shall be, as far as is practicable, close to the majority of those other subscribers whom they are most in the habit of calling.

The whole installation is very clearly and methodically made, every wire is easily visited, and the number of operations necessary to establish the communications are reduced to a minimum. Each group of twenty-five numbers has its call bell (a muffled one for day and a loud one for night use), telephone, microphone, and calling-key. The staff on duty in this office consists of one chief, two under chiefs, and twenty-three clerks, these latter all young ladies, who are found to be very quick and most apt at this work; for night work they are replaced by five men clerks. The number of calls made per day in this office amounts at present to an average of 7,000. Naturally some of the subscribers do not sometimes make a single call in the twenty-four hours, whereas others frequently make as many as forty or fifty. There are not more than 200 to 250 calls made in the night. The company has now some 1,400 subscribers on its books, but all are not as yet provided with wires.

Journal of the Telegraph.

PUBLISHED MONTHLY, ON 20TH OF EACH MONTH, AT
198 BROADWAY.

THE JOURNAL is issued on the 20th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,780 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....\$ 1 50
One Copy, six months, postage included..... .75
Single Copies, 15 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$ 3.00
Half Inch " "..... 1.00
Quarter Column, "..... 4.00
Half " "..... 8.00
One " "..... 16.00

Outs charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, MARCH 20 1882.

ANNOUNCEMENT—CHANGE OF PUBLICATION.

THE JOURNAL OF THE TELEGRAPH will hereafter be issued only on the 20th of each month, instead of semi-monthly, as heretofore.

Subscriptions are reduced to \$1.50 per annum. Those who have paid in advance will be credited on next year's subscription, or the money returned if they desire it.

ELECTRICAL PATENTS IN THE UNITED STATES.

The subject of patents has always been an interesting one in the United States, but it seems to be on the increase even now.

During the year 1831 nearly 16 000 patents were granted in the United States, a larger number than was ever granted before in this or any other country.

This would seem to indicate increased inducements to special inventors in certain lines of invention were it not for the fact that a careful study of their special classifications adopted by this patent office shows no marked increase in any particular class with one single exception, viz., electricity.

In that class there has been remarkable energy displayed, and the commissioner has found it necessary to divide the classification within the year by transferring to other divisions of the examining corps such details as could be properly spared, and yet not materially affect the class proper.

The division of electricity has grown to be the largest in the patent office, with an average monthly showing of over two hundred new applications.

It has been the practice in the Patent Office to observe with the greatest strictness a proper classification, and to this end only such details as gas

lighting devices, electrical registers, conductors, insulators, and, in short, those devices not purely electrical in their nature, have been lopped off. There are now employed in the electrical division one principal examiner, seven assistants, and three clerks, a larger force than in any other division in the office, and yet it has been found necessary to make the transfers above noted in order that the work might be kept up. On the above force there devolves the duty of examination as to novelty, utility, operativeness, &c., and oftentimes careful and accurate experiments are made to prove the assertions alleged in descriptions of inventions.

By order of Commissioner Marble, of the Patent Office, all United States patents appertaining to or bearing upon electricity granted prior to July 1st, 1881, have been reprinted and the drawings thereof reproduced and bound up in neat substantial quarto volumes of about two thousand pages each. There are sixteen such volumes, the subject matter of each being of such sub-classes as naturally relate to each other, thus giving in each volume a full *résumé* of the state of the art from its origin to date. There were issued to, and including, the above date, 3,825 such patents, which are subdivided into sixty nine sub-classes.

The following table shows the number of each particular kind of patent which relates directly to the telegraph, to wit:

| | |
|--------------------------|-----|
| Telegraphs..... | 46 |
| “ (automatic)..... | 111 |
| “ (dial)..... | 23 |
| “ (duplex)..... | 61 |
| “ (dynamo)..... | 8 |
| “ (multiplex)..... | 7 |
| “ (perforating)..... | 26 |
| “ (printing)..... | 191 |
| “ (quadruplex)..... | 19 |
| Circuit closers..... | 31 |
| Condensers..... | 5 |
| Electro-magnets..... | 42 |
| Keys..... | 42 |
| Lightning arresters..... | 8 |
| Morse registers..... | 20 |
| Relays and sounders..... | 111 |
| Conductors..... | 149 |
| Insulators..... | 107 |

In duplex and multiplex telegraphy there has been but little advance, but there are pending applications for patents for several valuable inventions.

In telegraphs and telegraph apparatus but slight advance is apparent, the leading inventions being in the applications of dynamo instead of batteries for telegraphic purposes.

There is also much interest manifested in relation to the Faure secondary battery, and applications are pouring in upon that subject, but as yet nothing appears to be any advance upon what Faure has done. There is, however, as much interest developed in dynamo machines, and there are at present pending over 150 applications.

The telephone occupies the minds of would-be patentees to a wonderful extent. The first telephonic telegraph patents were granted in 1875, and

before January 1st, 1878, they numbered less than two dozen. Now they constitute in all eight subdivisions embracing all kinds of telephones, telephone telegraphs, alarms, calls, appliances, &c., all told, 438 patents.

A large interest is also apparent in telephones and telephone exchange systems, and there are pending over two hundred applications on these devices.

Some idea may be formed about the interest manifested in America as to the future of the electric light when it appears that there are now pending over three hundred applications for patents on various features thereof, a large majority of such applications being for what is known as incandescent patterns and their appliances.

Taking the subject of electrical patents as a whole the most activity has been exercised within the following during the past three years: 1, electric lights; 2, dynamo-machines; 3, telephones and their appliances. Prior to January 1st, 1878, there were only twenty patents on electric lights; July 1st, 1881, there were 192. Prior to July 1st, 1879, there were only nineteen dynamo and magneto machines. July 1st, 1881, shows 111.

Where there are so many minds brought to bear upon kindred subjects it is not strange that many should invent the same thing, or take the same method of obtaining similar results in scientific experiments and investigations. This is found in the examining department of the patent office to often be the case with electrical appliances. Old patents are innocently re-invented and several persons frequently invent the same thing. This is mainly because they are prescribed by the immutable laws of science that must be always obeyed under certain given relations. Some of the wonders of electricity applied by Franklin in his investigations would be thought new and astonishing if shown for the first time at this day. In 1748, at a picnic, he “killed a turkey by the electric spark, and roasted it by an electric jark before a fire kindled by the electric bottle.”

The practical storage of electricity was long ago proved by Franklin's “bottled lightning.” If many of the inventions now prove to be of no immediate practical use or advantage, they may yet lead to something in the future that will be of constant use and great benefit to the world. This has always been remarkably true of electricity more than of any other department of science or mechanics.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

See the notice in another column of Supt. Abernethy's Instruction Book for railway and commercial telegraph operator, just published.

THE S. S. SILVERTOWN with 2 300 miles of cable on board, being the balance for the completion of the Central and South American Telegraph Company's lines arrived at Madeira on the 10th inst. and proceeded on her voyage the following day.

QUARTERLY REPORT OF THE WESTERN UNION TELEGRAPH COMPANY, FOR THE QUARTER ENDING MARCH 31, 1882.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, March 8, 1882.

The following statement will show the condition of the Company at the close of the quarter ended December 31, 1881:

| | |
|---|----------------------|
| Surplus October 1, 1881, as per last quarterly report | \$679,759 91 |
| Net revenues quarter ended December 31, 1881 | 1,731,725 09 |
| | <hr/> \$2,411,484 00 |

From which deducting appropriations for—

| | |
|---|----------------------|
| Dividend of 1½ per cent., paid January 16 | \$1,199,341 20 |
| Interest on Bonded Debt | 106,380 24 |
| Sinking Funds | 20,000 00 |
| | <hr/> \$1,325,721 44 |

Leaves a surplus January 1, 1882, of \$1,035,273 26

This statement closes the last quarter of the first year's operations of the Company since taking up the American Union and Atlantic and Pacific Telegraph Companies, with the following results for the calendar year 1881:

| | |
|----------------------|------------------------|
| Gross Revenues | \$174,848,396 24 |
| Expenses | 9,489,269 06 |
| | <hr/> \$165,359,127 18 |

For which profits have been appropriated—

| | |
|--|----------------------|
| For interest on bonds and sinking funds | \$467,173 65 |
| For 6 per cent. dividends on capital stock | 4,799,050 20 |
| | <hr/> \$5,266,223 85 |

Leaving surplus revenue for the year

| | |
|---|----------------------|
| Out of which surplus revenue there has been appropriated for new construction and investments in new property | \$2,112,903 34 |
| | <hr/> \$2,112,903 34 |

Deducting which leaves a net surplus for the year of

| | |
|--|----------------------|
| Which surplus added to the surplus at the beginning of the year of | \$886,988 12 |
| | <hr/> \$1,468,293 14 |

Makes the surplus January 1, 1882, as shown in the quarterly statement above

| | |
|--|----------------------|
| | <hr/> \$1,035,273 26 |
|--|----------------------|

The management having determined to open a separate account for construction and investments in new properties which go into the plant, and provide therefor for the surplus assets in the treasury, of which there are more than \$800,000 in value of available securities, the item of construction does not appear in the quarterly statement. This arrangement will leave all surplus earnings above fixed charges for interest and sinking funds, available for dividends; which is believed to be due to the stockholders.

The net revenues for the quarter ending March 31, inst., based upon nearly completed returns for January, partial returns for February, and estimating the business for March, will be about \$1,550,000 00

| | |
|---------------------------------------|----------------------|
| Add surplus January 1, as above | 1,035,273 26 |
| | <hr/> \$2,585,273 26 |

From which appropriating for—

| | |
|--|--------------------|
| Interest on bonded debt | \$106,700 00 |
| Sinking funds | 20,000 00 |
| | <hr/> \$126,700 00 |
| Leaves a balance of | \$2,458,573 26 |
| It requires for the payment of a dividend of 1½ per cent. on the capital stock | \$1,199,500 00 |
| Deducting which, leaves a surplus, after paying dividend of | \$1,259,073 26 |

In view of the preceding statements, the Committee recommend the adoption by the Board of the following:

Resolved, That a dividend of one and one half per cent. be, and is hereby declared payable on the 15th day of April next, to stockholders of record, at the close of business on the 18th day of March, instant.

Resolved, That for the purpose of such dividend, the stock books of the Company be closed at three o'clock on the afternoon of the 18th day of March, and be reopened on the morning of the 17th of April next.

Respectfully submitted,

NORVIN GREEN.

President.

INTERNATIONAL OCEAN TELEGRAPH COMPANY.

QUARTERLY PAYMENT.

New York, March 7th, 1882.

The guaranteed quarterly payment of one and one-half per cent. upon the Capital Stock of the International Ocean Telegraph Company for the three months ending March 31st, instant, is payable by the Western Union Telegraph Company at the office of its Treasurer, (Western Union Building), Broadway and Dey St., City of New York, on and after the first day of April next, to Stockholders of record on the 25th day of March.

By resolution of the Board of Directors, the transfer books will be closed at 3 o'clock on the afternoon of the 25th inst., and opened on the morning of the 3rd of April

O. F. ESTER.

Secretary.

TELEGRAPHERS' AID SOCIETY.

New York, March 14, 1882.

At the Annual Meeting of the Telegraphers' Aid Society, held March 12th, the following Officers and Committees were elected for the ensuing year:—

President, E. O. Cockey; Vice-President, A. T. Creelman; Secretary, W. Mayer, Jr.; Treasurer, F. W. Baldwin.

Executive Committee, P. J. Tierney, E. F. Cummings, J. M. Moffatt, M. M. Davis, K. O. Murray, G. A. Newton, J. W. Moreland.

Auditing Committee, L. R. Hallock, S. A. Coleman, E. T. Barberie.

WM. MAYER, JR.

Secretary, T. A. S.

ROTATION OF THE PLANE OF POLARIZATION.

Leo Grunmach reports an investigation which was based upon the supposed identity of the radiations of heat and light, and which leads him to the following conclusions: 1. In solid as well as in fluid diathermanous bodies there is an electro-magnetic rotation of the polarization plane of radiant heat in the direction in which the current flows through the spirals. 2. The magnitude of this rotation is very different for different substances, and appears to be nearly proportional to the index of refraction. 3. In the direct influence of a galvanic current upon the diathermanous bodies the amount of rotation is proportional to the intensity of the current. 4. When a diathermanous body is placed between the poles of an electro-magnet the rotation is proportional to the magnetic force. 5. The amount of rotation increases with the length of the stratum through which the rays pass, but the ratio of increase is not well established.

CHICAGO ELECTRICAL SOCIETY.

The Fifty-fifth regular meeting of the Chicago Electrical Society was held in one of the spacious club rooms of the Grand Pacific Hotel, Monday evening, February 27th, President Haskins in the chair.

The evening being very stormy a full attendance was not expected, but it was found necessary to provide additional seating room for the people before the commencement of the exercises.

There being two papers to be presented to the audience the consideration of regular business was postponed, and the President introduced Dr. Roswell Park, who favored the society with a carefully prepared paper on "The Applications of Electricity to Surgery."

In opening the Doctor ran briefly over the history of the subject.

The electric current was first suggested as a means of causing blood coagulation by Sudamora, and was first put in practice in 1832 in treating aneurisms. Schuster in 1839 first successfully employed electro-puncture in the treatment of serous effusions. During the same year Crussel began his experiments in electrolysis. In 1845 Heider employed the galvanic current of a single cell for the purpose of killing nerves in decayed teeth. In 1846 Crussel removed, by the heated wire, a large vascular tumor from the face.

Petrequin, also, obtained successful results in the galvanic treatment of aneurisms. In the following year, Bartani and Milani treated varicose veins by alvano puncture, and Crussel introduced the method of treating ulcers and similar open sores by a mild galvanic current produced in the following manner. A piece of tinfoil is cut to the size of the ulcer and placed thereon; a strip of copper is placed around the limb or body near the ulcer and a projecting point of the copper touches the tinfoil; a cloth saturated with vinegar or some dilute mineral acid is then bound around the copper. The success of this treatment has been very marked in causing a healthy growth in indolent ulcers.

An important impulse was given by Middeldorpf, who published, in 1854, a large work on the galvanic cauter. Many profited by his experiences and directions and he had hosts of followers.

Geissler first used the electric spark, in the tubes which now bear his name, to illuminate the nostrils for the purpose of performing a surgical operation. Frequent use is now made of the incandescent wire with suitably inclined mirrors, which shall reflect the light in the proper direction.

The most complete, ingenious, extensive and massive apparatus for this purpose is that devised by Leiter of Vienna. There is, probably, but one in this country, that imported especially for the new Reese hospital in this city.

One of the most important uses of electricity is in diagnosis, in determining whether one group of muscles is stronger than its antagonistic group, especially in cases of deformity and fixed limbs.

It is especially useful in detecting fraud and malingering, especially in the cases of soldiers.

As long ago as 1793 the electric current was suggested for the purpose of distinguishing life from death. Slight anæsthesia may be produced by the Faradic current. A powerful current is also used to produce the electric moxa, which is very painful but is a source of speedy relief in many neuralgic affections.

Electrolysis is a very important branch of the subject. This is simply decomposing or disengaging by means of electricity.

The Doctor illustrated this by electrolyzing the white of an egg. But living tissues are better

adapted for this process than any inert substance, as the solutions are warm, therefore better conductors and because the products of decomposition are capable of being absorbed and are thus partially, if not wholly, disposed of while being formed. This process is especially applicable to tumors, causing them to greatly decrease in size, and, if the result be favorable, entirely disappear.

High tension currents are required for this process. Little or no bleeding follows such an operation, there is less liability to shock and reaction than after the use of the knife; healing is usually satisfactory; there is but little risk of blood poisoning, and last, but not least, we avoid the use of the knife.

The incandescent wire is now used in actual cautery where the hot iron was formerly used.

The advantages are obvious. The wire can be used where it would be impossible to use the iron, the heat can be turned on or off as required. The apparatus is much more elegant, portable and convenient than the furnace and irons.

Surgical operations may be performed in places not readily accessible to the knife, as tumors in the mouth, throat, nose, etc., where we especially desire to avoid hemorrhage.

This process may be used whenever cauterization is required, and is usually followed by very satisfactory healing.

Quantity currents are required for this purpose.

The Doctor gave very full explanations of the different batteries and instruments used in surgery, exhibiting a large number of them.

The Doctor was listened to with the closest attention, and at the close of his paper he was greeted with merited applause.

The President then introduced Dr. Wellington Adams, who made a few remarks on the origin and nature of Force and the "future of Electricity."

As zinc is about thirty times as costly, and only contains one-tenth the energy of coal, it will be seen that the present forms of batteries are very expensive. The steam engine is too wasteful, using only about one-tenth of the energy of the fuel.

The machine of the future must produce electricity directly by slow combustion—and this force being conveyed to an electric motor will drive any machinery. Then it will be possible to travel either on a railroad or street car without smoke, steam, horses or underground cables; a few shovelfuls of coal in one corner of the car supplying the motive power.

A railway between New York and Chicago will yet be run by electricity generated at Niagara Falls, and the electric power and light will yet be carried into the workshops and homes of the people.

The society then adjourned—the audience being well satisfied with an evening profitably spent.

D.

THE UNIFORM TIME QUESTION.

In response to the circular sent out by the Secretary of the General Time Convention asking for communications bearing upon the matter of a standard time for the railways of the United States and Canada, Admiral John Rodgers, Superintendent of the United States Naval Observatory, has written a very interesting letter. He says:—

The various countries of the world generally have their own prime meridian as Greenwich, Paris, Pulkova, &c., and the national maps are drawn to the respective national prime meridians. The maps of the United States are drawn with reference to the meridian of Washington. The observatories of Europe, Pulkova, Greenwich, Paris, &c., give time to their

respective nations. In England the differences of longitude are not great, and all England uses Greenwich time. But the extent of the United States renders a single time impracticable, for by the hour at any place is only sought an expression for the relative position of the sun in regard to that place. At the noon of any locality the sun is on its meridian; at one o'clock it is one hour past meridian; at midnight it is on the lower meridian, or just under the feet, and at one o'clock at night it is one hour past the lower meridian. All this is very elementary and is known to every one.

By local time man must live, move and have his being. Other standard for his daily avocations is chimerical, fit for speculation, but utterly impracticable. Sailors have for a long time kept on board ship, for their practical purposes, two times—namely, local time for the daily uses of life, and the time of the national meridian, for astronomical purposes. This is Greenwich, Paris, Pulkova or other, according to nationality. This arrangement at sea is in constant use by a community far from a learned one, according to shore standards. The system must be plain and practical to landmen, since it is plain and practised by seamen.

The plan of time zones seems to me a plan for legalizing diversity. It is against diversity that the country protests, as applied to railroad service. Two neighbors separated by a fence may live in different zones or two villages near one another may have different zones and different legal times, in which case business will be carried on between them with more difficulty than with natural time, by which people dwelling near one another will have substantially, agreement in their watches. Two railroads on different sides of a river may have different zones and trains collide for want of agreement. Except in towns of some size no one would know his zone, for zones cannot be marked. The State lines are too irregular in shape to serve for a guide, nor have we custom houses on the borders to inform travellers of the name of the State into which they enter.

Learned societies may recommend artificial time for the use of man, but it is to be apprehended that the community may refuse to accept it. When the laborer, who has worked from sunrise until noon, is gravely told that noon comes at one o'clock, will he not object? In short, men will continue to keep natural time for their daily uses whatever different practice conventions may recommend.

In conclusion, I beg leave to recommend that in the railroad guides the time of Washington, the national meridian of the United States, be published opposite to the movements of through trains, leaving the trains to run on Boston time or Ogden or San Francisco, or such other time as the directors may prefer. This plan invades no right now enjoyed; it changes no practice; it only adds to the tables a few columns of figures. I would also recommend that the clocks at railroad stations be furnished with two sets of hands, gilt hands for Washington time and black hands for local time. These hands separated by a constant difference equal to the differences of longitude, will always show at a glance the time required, whether local or Washington.

THE POST-OFFICE.

One of the largest express companies and dealers in exchange in the world is the Government of the United States. The difference between the postal service and the express and transportation companies is that the people of the United States hire private corporations to do their heavy freighting business, and pay them what the aforesaid companies can manage to exact, while they have organized a

co-operative concern for the distribution of letters, small packages and small bills of exchange, and the business is done, not for the most that can be got from its customers, but for the least that will pay expenses. As it is deemed important that the charges should be low, it is not even attempted to quite pay expenses, the deficit being made up out of general taxation. In other words, nearly 95 per cent. of the cost of operating the service is collected from those who use the service, and in proportion to the amount they use it, and the other 5 per cent. is paid out of the general treasury.

In its vastness the postal business looks down from a towering height upon most of the railroad and transportation companies. The routes over which the Government sends the mails aggregate 344,000 miles, or distance equal to about fourteen circumferences of the earth. Its immediate agents, not counting mere employees, number 44,512. The postmasters in the United States would make two army corps—that is, they would if they were all forced into the army. The salaries paid to these agents amount to more than eight millions of dollars, or about the same as the total net ordinary revenues of the Government, including loans, in so recent a year as 1843.

THE SCIENTIFIC AMERICAN NEW OFFICES.

The Scientific American came out of the late fire in New York, like the fabled Phoenix, with renewed life. The subscription lists, account books, patent records, patent drawings and correspondence were preserved in massive fire-proof safes. The printing of the Scientific American and supplement was done in another building; consequently the types, plates, presses, paper, etc., were unharmed, and no interruption of business was occasioned. The new offices are located at 261 Broadway, corner of Warren street, a very central and excellent situation. We take this occasion to say that the Scientific American is one of the most useful and interesting publications of modern times.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

P. O. Box 3175, New York.

ASSESSMENT No. 150.—March 20, 1883.

JOSEPH E. RANNEY.

HUBERT L. GRAMZOW.

JOSEPH E. RANNEY died at Peoria, Ill., Feb. 17, 1882, of Consumption. His certificate, No. 1953, was issued April 2, 1878. The above claim will be paid from surplus.

HUBERT L. GRAMZOW died at Ogden, Utah Ty., Feb. 21, 1882, of Drupey. His certificate, No. 3189, was issued Nov. 16, 1877. One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4670.

Insurance expires April 19, 1883; Membership, May 19, 1882. The number of members of the Association in good standing is: 1st Division, 2183; 2nd division, 130.

Remittances will be acknowledged by Agents of the Association when postage or postal card is enclosed; and an Agent's receipt is a sufficient voucher for all dues from Members. Remit by draft, express, P. O. order, or registered letter. Money forwarded by mail or messenger will be at the risk of sender. A number of assessments may be paid in advance, to avoid small remittances.

BY-LAWS—SECTION VIII. "Upon the death of a member of the Association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and in case payment shall not be made within 30 days thereafter, the delinquent shall forfeit all claim to the benefits of the Association; and should payment not be made within 60 days, shall forfeit membership, to which said delinquent can only be restored as provided in Section VII. of these By-Laws."

N. B.—AGENTS, especially those recently appointed, are—in accordance with Section III By-Laws—respectfully reminded that, on the expiration of thirty days from the date of an assessment, all money on hand should be remitted to the Secretary; and they will facilitate the business, and insure accuracy of the records of collections of assessments, by making their return on the first of each month for the current assessment, including all collections on previous ones not yet remitted; and on the 10th of the month, a supplementary remittance covering any payments subsequently received by them. By the adoption of this plan but few, if any, numbers of certificates on which assessments may have been paid will appear in the list of delinquents printed in the JOURNAL OF THE TELEGRAPH.

A. E. BREWER.

Secretary,
NEW YORK.

P. O. Box. 3177

FRANKED MESSAGES TO AND FROM THE GREAT NORTH WESTERN TELEGRAPH COMPANY'S OFFICES.

WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, March 20, 1892.

To all offices:

WESTERN UNION franks are not good for messages over the lines of the Great North Western Company; and Great North Western franks are not good for messages over the lines of the Western Union Company.

Messages to and from the offices of the Great North Western Telegraph Company in Canada, (Ontario, Quebec and Manitoba), which are entitled to free transmission over the lines of but one of the two companies, will on and after April 1, 1892, be treated in accordance with the following instructions, which will take the place of all previous orders on the subject.

On Messages offered by parties holding Western Union franks charge 25 and 1, and check thus, for example:

10 DH. and 25 paid, or

11 DH. and 25 collect,

(the word collect being counted according to rule, but not charged for.)

On messages offered by parties holding Great North Western franks charge as follows:

If your rate to the Ontario, Quebec, or Manitoba office, to which the message is to be sent is 50 and 3, charge 25 and 2; if over 50 cents, deduct 25 from the rate and charge the remainder, i. e. if your rate is 6) and 4, charge 35 and 2; if 75 and 5, charge 50 and 3, &c., and check thus, for example:

10 paid 35 and DH., or

11 collect 35 and DH.

(the word collect being counted according to rule, but not charged for.)

The full check, including amount of tolls and abbreviations D.H., must be transmitted with the message.

Messages such as above described should be booked as paid and also as free, and the office to which they are addressed, or at which they originate, should be checked direct on paid message check report and also on free message check report. A copy of the message in each case should be made for the paid message file, the original being turned in as a free message.

THOS. T. ECKERT,
General Manager.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, March 20, 1892.

To all offices on Western Union lines:

The following changes which have been made since March 1, 1892 should be entered in the Tariff Book as they will not be republished.

CHANGES.

On and after April 1, 1892, no collect or night messages should be accepted for any of the places named below. To meet the requirements of the connecting company the tariff or "other" lines on messages to these places should be computed on three more words than the messages contain. For example: If a message contains eight words, count and charge for eleven; if it contains nine words, count and charge for twelve, etc. The offices above referred to are as follows:

ILLINOIS.

Baltimore Junction and Kingston, Cook Co.

INDIANA.

Erment, Cromwell, St. Joe, Suman, and Syracuse.

MARYLAND.

Adamstown, Altamont, Annapolis, June, Boyds, Deer

Park, Ellicott's City, Frederick Junction, Gaithersburg, Hyattsville, Laurel, Mt. Airy, Oakland, Phase No. 4, Relay Station, Rockville, Sandy Hook, Sykesville, Washington Junction, and Weaverton.

OHIO.

Alta, Attica, Bascom, Batavia, N. Co., Belleville, Black Hand, Bloomdale, Chicago Junction, Delaware Bend, Fredericktown, Hicksville, Hoyt's Corner, Independence, Lewis Mills, Lexington, New Baltimore, Quaker City, Republic, Somerset, Spencerville and Utica.

VIRGINIA.

Edinburg, Middletown and Stephenson's Depot.

WEST VIRGINIA.

Benwood, Berkeley Springs, Cairo, Cameron, Central Station, Charlestown, Jeff Co., Cherry Run, Clarksburg, Cornwallis, Cranberry, Doe Run, Farmington, Flemington, Governor's Gap, Gratton Green Spring, Harper's Ferry, Janele, Kanawha, Wood Co., Keyser, Littleton, Lost Creek, Moondaville, Newburg, No. 12 Water Station, Pennsboro, Petroleum, Piedmont, Rowlesburg, Salem, Sir John's Run, Summit Point, Texas, Tunnelton, Volcano, Weston.

The following should be added to the list of Great North Western Telegraph offices in last JOURNAL:

MANITOBA.

Austin.
Brandon.
Dewinton.
Dominion City.
Emerson.
Gladstone.
Meadow Lea.
Niverville.
Otterburn.

Portage La Prairie.
Portage La Prairie Station.
Reburn.
Rosser.
Stonewall.
Sewell.
St. Boniface Junction.
Westbourne.
West Lynna.
Winnipeg.

NEW BRUNSWICK.

3 Barnaby River.
3 Bartibogus.
3 Bathurst.
3 Bathurst Station.
3 Beaver Brook.
3 Belledune.
3 Berrys Mills.
3 Bridgetown.
3 Buctouche.
3 Campbellton.
3 Campbellton Station.
3 Canaan.
3 Carquette.
3 Carlton Station.
3 Charlo.
3 Chatham.
3 Chatham Junction.
3 Clifton.
3 Coal Branch.

3 Dalhousie.
3 Dalhousie Station.
3 Ferris.
3 Grand Anse.
3 Jacques River.
3 Kingston.
3 Kouchibouguac.
3 New Castle.
3 New Castle Station.
3 New Mills.
3 Petit Rocher.
3 Potemouche.
3 Red Pine.
3 Richibucto.
3 Shippegan.
3 St. Peters.
3 Tracadie.
3 Weldford.

NEW YORK.

56 Keeneyville.
78 Morrisstown.

Erase the following Great North Western offices given under New York in last JOURNAL: Burdighs, Henderson Harbor, Martinsburg, Single Creek, and West Constable.
64 Sandy Hill should read 64 Sand Hill.

ALABAMA.

* Lafayette, 25 3 (25 1 N. M. rate), Opelika.

COLORADO.

599 Cranes Park, closed.

DAKOTA.

926 Kimball. Erase "P. O. care Andover."

FLORIDA.

* Warrington, now 315 Warrington. Ok. Pensacola Navy Yard.

ILLINOIS.

316 Cary. Erase "Ch. Crystal Lake."
* Mason, now W. Union office, Square 317.

INDIANA.

261 Millersburg. Erase "Open at night only."

IOWA.

426 Coalstown, changed to 426 Angus.

KANSAS.

457 Arcadia, closed.
407 Chippewa, changed to 507 Hazelton.
503 Cottonwood, changed to 503 Strong City.
456 Doniphan, closed.

KENTUCKY.

The telephone line from Frankfort to Fannale, Lawrenceburg and Tyrone is now working. The tariff from Frankfort to these places is 25 3 by telephone.

LOUISIANA.

* Coushatta, closed.

Erase * * Natchitoches.
* Ringold, closed.

MANITOBA.

The following offices of the Great North Western Telegraph Co. will on and after April 1, 1892, be checked direct. The tariff to these offices will be the state rate to Manitoba.

| | |
|----------------|-----------------------------|
| Austin. | Portage La Prairie. |
| Brandon. | Portage La Prairie Station. |
| Dewinton. | Stonewall. |
| Dominion City. | Rosser. |
| Emerson. | Reburn. |
| Gladstone. | Sewell. |
| Meadow Lea. | St. Boniface Junction. |
| Niverville. | Westbourne. |
| Otterburn. | Winnipeg. |

Some of the above are new offices and will appear in next JOURNAL.

MASSACHUSETTS.

* * Elmwood, now * Elmwood, 15 0 by telephone E. Bridge-water.

28 Otter River. Erase "Ch. Templeton."

MEXICO.

In messages to Mexico, addressed to one party in "care of another," only the name of the first and the destination will be sent free. For example: Jose Maria Garcia, care of Dr. Pedro Garcia, Calle numero 39, Vera Cruz. The words "Care of Dr. Pedro Garcia" will be counted and charged for.

MICHIGAN.

250 Palmers, changed to 250 Orleans.

MINNESOTA.

* Isinours, now 20 2 Ramsey, Minn., or La Crosse, Wis.
889 Warren is in Marshall Co.

NEVADA.

* Candelaria is now W. Union office, square 977.

NEW MEXICO.

828 Los Cruces should read 828 Las Cruces.

NEW YORK.

45 East Albany, now * * East Albany, 15 cents delivery from Albany.

* * Elmira Water Cure, now 10 cents by telephone from Elmira.

41 Fort Hamilton, closed.

* * Franklin, Onelda Co., is now W. Union office, square 87

P. O. Franklin Iron Works.

81 Henderson Harbor, closed.

44 Martins, changed to 44 Millers Saranac Lake House.

56 Rhingle Creek, closed.

OHIO.

302 Alum Creek. P. O. care Ohio Cent. R. R., Columbus.

Erase 231 North Fayette, on page 231.

150 Olmstead sta., changed to 150 West View.

* * Tremont should read * * Tremont City, 75 0 Bowdenville.

ONTARIO.

Prospect House should read Prospect House, Niagara Falls.

PENNSYLVANIA.

151 Claysville, closed.

111 Idlewild, closed.

RHODE ISLAND.

* * Wickford Village, now 25 0 by telephone from Providence. Erase "100 0 Wickford Sta."

TEXAS.

* * Edinburg, closed.

UTAH.

576 Wanship, closed.

VERMONT.

39 Manchester Depot. Erase "Ch. Manchester."

WYOMING.

573 Church Buttes, closed.

ATLANTIC CABLE.

CORRECTIONS IN MESSAGES.

On and after 1st April, 1892, the present rule with regard to corrections in Atlantic Cable messages will be cancelled and the following substituted:

Every message forwarded at the request of the sender or receiver to rectify or complete a message already transmitted, or in course of transmission, will be charged for at full rate.

The charges will be refunded without delay to the person who paid them if it be found that the telegraph service has been in fault.

No return of charges will be made upon the original message which has been corrected in this manner and no claim for rectifications obtained direct between senders and receivers will be entertained.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in three columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

| | | |
|-------------|----------------|-----------------|
| 318 Akron | 323 Cuba | 324 Prichard. |
| 285 Bangor. | 323 kpos. | 266 Stock Mill. |
| 294 Calera. | 298 Falkville. | 267 Notasulga. |

* Ft. Morgan, 75 5 Mobile.
* Gainesville, 25 2 Epes.
* Point Clear, 50 3 Mobile.

ARIZONA.

| | | |
|--------------------|---------------|--------------|
| 639 Bowie Station. | 659 Holbrook. | 659 Winslow. |
| 660 Canon Diablo. | | |

* Pinal, 50 4 (30 2 N. M. rate) Casa Grande.
* Silver King 50 4 (30 2 N. M. rate) Casa Grande.

ARKANSAS.

| | | |
|----------------|------------------|----------------|
| 449 Brentwood. | 391 Jacksonport. | 449 West Fork. |
|----------------|------------------|----------------|

CALIFORNIA.

| | | |
|---------------------|-------------------|------------------|
| 827 Albion Mills. | 800 Ocean View. | 826 Table Bluff. |
| 800 Decoto. | 720 San Geronimo. | 827 Whitesboro. |
| 799 Norman Station. | | |

* Bidwell's Bridge, 25 2 by telephone, Greenville.
* Lafayette, 15 2 by telephone, Martinez.
* Walnut Creek, 15 2 by telephone, Martinez.

COLORADO.

| | | |
|-----------------------|------------------|-------------------|
| 546 Agate. | 559 Earle. | 557 Red Cliff. |
| 546 Bennett. | 541 First View. | 534 Rockwood. |
| 546 Boreas. | 545 Hardin. | 538 Sargents. |
| 523 Browns Canon. | 590 Holleys. | 536 Sedgwick. |
| 540 Buffalo, Weld Co. | 599 Hortense. | 545 Snyder. |
| 525 Calumet. | 525 Hot Springs. | 558 South Pueblo. |
| 552 Carr. | 534 Ignacio. | Ok. Pueblo. |
| 540 Crook. | 540 Hill. | 599 Tennessee. |
| 545 Denel. | 545 Orchard. | 592 Timpa. |

* Conejos, 25 0 Antonio.
* Eckley (N. M.) 50 4 Plattsmouth, Neb.
* Rock Springs (N. M.) 60 4 Plattsmouth, Neb.

CONNECTICUT.

| | | |
|---------------|----------------|-------------|
| 25 Hop River. | 29 South Lyme. | 37 Stepney. |
|---------------|----------------|-------------|

* Bridgewater, 20 0 by telephone, New Milford.
* Naubuc, 30 3 Hartford.
* Noroton, 10 0 by telephone, Stamford.
* Warren, 20 0 by telephone, New Milford.
* Whitneyville, 50 0 New Haven.
* Winnipauk, 10 0 by telephone, Norwalk.

DAKOTA.

| | | |
|---------------------|----------------|-----------------|
| 896 Big Stone City. | 890 Gardner. | 926 Miller. |
| 940 Canning. | 890 Hillsboro. | 898 Montrose. |
| 915 Chamberlain. | 926 Hitchcock. | 920 Northville. |
| 947 Dickinson. | 947 Houston. | 915 Ordway. |
| 898 Eagles Nest. | 896 Kindred. | 908 Preston. |
| 919 Eldridge. | 895 Mayville. | |

* Crook City, 50 2 by telephone, Deadwood.
* Colman, 35 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Dell Rapids, 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Fgan, 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Howard, 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Madison, 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Pine Ridge Agency, 150 9 Cheyenne Wy.
* Rosebud Agency, 175 10 Cheyenne Wy.
* Spear Fish, 50 2 by telephone, Deadwood.
* Sturgis City, 50 2 by telephone, Deadwood.
* Wentworth, 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.

DELAWARE.

67 Kiamenst.

FLORIDA.

* Blue Pond, 75 5, (50 3 N. M. rate) Lake City
* Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
* Highland, 50 4 Lake City.
* K. Simcoe (N. M.), 150 10 Lake City.
* Paola, (N. M.) 100 6 Lake City.
* Perry Junction, 75 5, (50 3 N. M. rate) Lake City
* Tocol, (N. M.) 50 3, Lake City.
* Waite Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

| | | |
|-----------------|-------------------|--------------|
| 307 Dubois. | 187 Folkston. | 246 Roswell. |
| 246 East Point. | 186 Perkins June. | |

* Abbeville (N. M.) 40 3 Ft. Gaines.
* Arlington, 40 3 Ft. Gaines.
* Blakely, 40 3 Ft. Gaines.
* Senoia, (N. M.), 35 2 Newnan.

IDAHO.

| | | |
|------------------|---------------|----------------|
| 578 Arimo. | 970 Dry Lake. | 970 The Front. |
| 970 Ocoana Lake. | 970 Rathdrum. | |

ILLINOIS.

| | | |
|-------------------|---------------------|-----------------------|
| 316 Algonquin. | 298 Bonfield. | 309 Montrose, Effing- |
| 300 Allendale. | 337 Breckenridge. | ham Co. |
| 307 Alpine. | 307 Dummer. | 307 New Lebanon. |
| 316 Annawan. | 346 Forreston June. | 347 Oakford. |
| 328 Beecher City. | 318 Gays. | 318 Stockton. |
| Effingham Co. | 316 Lanark June. | 346 Union Grove. |
| 329 Belknap. | 307 Mannheim. | |

INDIANA.

| | | |
|------------------------|-------------------|----------------|
| 252 Briant. | 253 Letts Corner. | 290 Paxton. |
| 300 Cynthiana. | 298 Lowell. | 295 Rose Lawn. |
| 240 English Lake. | 292 Milroy. | 271 Sedalia. |
| 299 Fountain, Vigo Co. | 280 Monon. | 263 Westport. |
| 300 Ingles. | 261 Oslan. | |

* Ferdinand. By mail, Ferdinand Station.
* Illiana, free, by telephone, Dana.
* St. Meinrad. By mail, Ferdinand Station.

IOWA.

| | | |
|-----------------------|-------------------|----------------------|
| 426 Angus. | 426 Herndon. | 346 Riggs, Ok. Pres- |
| 387 Ashton. | 426 Irvington. | ton. |
| 446 Browns, Ok. Pres- | 416 Kamrar. | 426 Rutland. |
| ton. | 454 Irwin. | 473 Salix. |
| 367 Buffalo. | 445 Kirkman. | 367 Sand Spring, Ok. |
| 425 Dakota City. | 388 La Crea. Ok. | Anamosa. |
| 367 Donahue, Ok. | Hamill. | 416 Thor. |
| Dixon. | 435 Lake City. | 416 Turall. |
| 367 Fairport. | 407 Laurel. | 407 Van Cleave. |
| 435 Farhamville. | 397 Libertyville. | 417 Van Wert. |
| 416 Galt. | 435 Lohrville. | 367 Viola, Ok. Stone |
| 407 Girard. | 367 Montpelier. | City. |
| 425 Hardy. | 455 North Boro. | 425 West Bend. |
| 416 Harcourt. | 416 Pilot Mound. | 425 Willow Glen. |
| | 417 Polo. | |

KANSAS.

| | | |
|-----------------|---------------|---------------------|
| 517 Alum Creek. | 527 Collyer. | 527 Lenora. |
| 456 Argentine. | 503 Crawford. | 448 Mulberry Grove. |
| 456 Barclay. | 527 Edmond. | 503 Strong City. |
| 521 Chase. | 514 Garva. | 518 Valley Center. |
| 527 Cleveland. | 507 Hazelton. | 475 Wakarusa. |
| 517 Clinton. | 503 Horton. | 466 Westphalia. |

* Cottonwood Falls, 50 0 Strong City.
* Enterprise, 15 0, by telephone, Detroit.

KENTUCKY.

| | | |
|--------------------|-----------------|-------------------|
| 263 Bloomfield. | 263 Finchville. | 298 Rocky Hill. |
| 263 Crescent Hill. | 243 Pine Hill. | 263 Taylorsville. |

* Clay Lick, 25 1 by telephone, Worthville.
* Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Hunting-

ton, W. Va.
* Eastern June, 50 3 Lexington, Ky., or 35 2 Hunting-

ton, W. Va.
* East Ky. June, 35 2 Huntington, W. Va.
* Flemingsburg, 15 2 by telephone, Johnson June.
* Glendale, 25 1 by telephone, Worthville.
* Gratz, 25 1 by telephone, Worthville.
* Kilgore, 30 2 Huntington, W. Va.
* Lockport, 25 1 by telephone, Worthville.
* Marion, 15 1 by telephone, Worthville.
* Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington,

W. Va.
* Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W.

Va.
* Pine Grove, 50 3 Huntington, W. Va.
* Port Biffe, 25 1 by telephone, Worthville.
* Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
* Springport, 20 1 by telephone, Worthville.

LOUISIANA.

| | | |
|-----------------|--------------------|------------------|
| 424 Eola. | 434 Mermontau. | 442 San Patrice. |
| 424 Garland. | 383 Mounds Sta. | 433 Stonott. |
| 424 Gloster. | 442 Pleasant Hill. | 442 Stonewall. |
| 442 Grand Cane. | 433 Provençal. | 424 Whitesville. |
| 354 Lookout. | 433 Pradomme. | |
| 414 Lecappte. | 433 Robeline. | |

* Millikens Bend (N. M.), 40 3 Tallulah.
* Plaquemine, 50 3 New Orleans.
* St. James, 50 3 New Orleans.
* Vacherie, 50 3 New Orleans.

MAINE.

4 Presque Isle.

MARYLAND.

| | | |
|-----------------|---------------------|------------------|
| 85 Ashland. | 77 Marlboro. | 54 Pocomoke Sta- |
| 77 Bowie. | 67 Otterora. | tion Ck. Poko- |
| 67 Edgewood. | 85 Odenton. | moke City. |
| 85 Lutherville. | 54 Peninsular June. | |

* Hyattsville, 25 2 Baltimore, Md., or Washington, D. C.

MASSACHUSETTS.

| | | |
|-------------|-------------------|--------------------|
| 36 Conway. | 21 Westley Hills. | 12 W. Harwich, Ok. |
| Dennisport. | | |

* Aylum sta., 75 0 Danvers.
* Bass River Harbor, free by telephone, So. Dennis.
* Cocheset, 25 0 by telephone, East Bridge water.
* Collins' Mills, Dracut, 15 1 by telephone, Lowell.
* Danvers Centre, 25 0 Danvers.
* Danvers Insane Hospital, free by telephone, Danvers.
* Danversport, 25 0 Danvers.
* Dracut Navy Yard, 15 1 by telephone, Lowell.
* Forge Village, 15 1 by telephone, Lowell.
* Gardner, 15 0 Gardner Depot.
* Grantville, 15 1 by telephone, Lowell.
* Hyannisport, 15 0 by telephone, Hyannis.
* Lunenburg, 20 0 by telephone, Fitchburg.
* Matfield, 50 0 East Bridgewater.

* Melrose Highlands, 25 0 Melrose.
* Middlesex Village, 15 1 by telephone, Lowell.
* No. Middleboro, 150 0 Middleboro.
* Phenix Village Tewksbury, 15 1 by telephone, Lowell.
* Rock, 150 0 Middleboro.
* South Billerica, 15 1 by telephone, Lowell.
* So. Gardner, 15 0 Gardner Lepot.
* South Mills, 10 0 by telephone, New Bedford.
* Weentham, 35 0 by telephone, Providence, R. I.
* West Bridgewater, 15 0 by telephone, East Bridgewater.
* W. Chelmsford, 15 1 by telephone, Lowell.
* W. Danvers, 150 0 Danvers.
* Westford, 25 0, Westford Depot.
* Westford Depot, 15 1 by telephone, Lowell.
* West Gardner, 15 0 Gardner Depot.

MEXICO.

* Paso del Norte, 05 0 El Paso, Tex.

MICHIGAN.

| | | |
|-----------------------|-------------------|--------------------|
| 138 Beaver Lake. | 230 Garfield. | 231 North Fayette. |
| 220 Beech. | 137 Hobart. | 231 North Morenci. |
| 231 Bridge water. | 127 Indian River. | 250 Orleans. |
| 211 Britton. | 231 Jerome. | 26 3 Shelbyville. |
| 210 Brockway Central. | 19 Manistee June. | 127 Tropic. |
| 260 Crapo. | 210 Marlette. | 127 Vanderbilt. |
| 210 Fosteria. | 210 Mayville. | 100 Wenzell. |
| 127 Freedom. | 260 Moline. | 127 Wolverine. |
| 119 Free Holl. | 127 Mullet Lake. | |

* Flushing, 15 0 by telephone, Flint.

MINNESOTA.

| | | |
|-------------------|-----------------------|-----------------------|
| 190 Argyle. | 865 Minnetonka. | 869 Rock Island Quar- |
| 865 Arlington. | 865 Minnetonka Mills. | ry. |
| 875 Buffalo Lake. | 867 Mission Creek. | 892 Slayton. |
| 889 Kennedy. | 890 Muskoda. | 876 Vernon Centre. |
| 861 Minnehaha. | 870 Osawa. | 865 Waconia. |
| | | 865 Winthrop. |

* Orris, 25 2 Tracy.
* Deforest, 40 3 Ramsey, Minn., or 5 3 La Crosse, Wis.
* Prairie June, 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis.

MISSISSIPPI.

| | |
|----------------|-------------|
| 351 Courtland. | 363 Morton. |
|----------------|-------------|

* Arcola, 35 6 Vicksburg.
* Johnsonville, 35 6 Vicksburg.
* Stoneville, 35 6 Vicksburg.

MISSOURI.

| | | |
|------------|-----------------|----------------------|
| 457 Ellis. | 428 Montserrat. | 398 Shelbyville, Ok. |
| 369 Etiah. | | shelbina |

* Augusta, By mail, Labadie.
* Greenfield, 50 0 So. Greenfield.
* Purdin, 25 2 Unionville.

MONTANA.

| | | |
|-----------------|----------------------|------------|
| 957 Iron Butte. | 583 Melrose. | 957 Terry. |
| 956 Keith. | 583 Silver Bow June. | |

NEBRASKA.

| | | |
|------------------|--------------|----------------|
| 927 Atkinson. | 464 Gilmore. | 922 Long Pine. |
| 538 Chappell. | 927 Inman. | 927 Stuart. |
| 922 Clear Water. | | |

* Benkeman, (N. M.) 60 4 Plattsmouth.
* Burchard, (N. M.) 35 2 Plattsmouth.
* Liberty, (N. M.), 35 2 Plattsmouth.

NEW BRUNSWICK.

| | | |
|------------------------------|---------------|------------|
| 3 Albert. | 3 Lake Ha Ha. | 3 11 Louis |
| 3 Carleton Sta. | | |
| Port Elgin, 25 2, Sackville. | | |

NEVADA.

| | |
|-------------|-------------------|
| 676 Luning. | 676 Soda Springs. |
|-------------|-------------------|

NEW HAMPSHIRE.

30 Livermore.
* Chesterfield, 25 0 by telephone, Brattleboro, Vt.
* Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
* North Hinsdale, 20 0 by telephone, Brattleboro, Vt.

NEW JERSEY.

| | | |
|------------------|----------------------|--------------|
| 41 Brick Church. | 41 Centreville, Pas- | 47 Magnolia. |
| Tariff same as | salo Co. | 52 Valley. |
| Orange. | 47 Clementon. | 41 Wayne. |
| 53 Cedar Brook. | | |

NEW MEXICO.

| | | |
|----------------|---------------|------------------|
| 559 Blossburg. | 637 Coolidge. | 632 Monero. |
| 566 Carrizosa. | 637 Gallup. | 630 San Antonio. |
| 559 Dillon. | 633 Lava. | 636 Upham. |

* Fort Stanton, 25 3 San Marcial.

NEW YORK.

| | | |
|----------------------|---------------------|-------------------|
| 64 Albion Station. | 40 Henonville. | 74 Scriba. |
| Oswego Co. Ok. | 56 Keeneville. | 44 Trembly's Iron |
| Sand Bank. | 64 Manneville. | Works. |
| 65 Apalachin. | 44 Millers' Farmac. | 65 Vestal. |
| 46 Cornwall on Hud- | Lake House. | 46 Walkhill. |
| son. | 83 Nichols. | 83 North Lansing. |
| 51 Fish's Eddy, Del- | 51 Rockland. | 46 Wicopee June. |
| aware Co. | | |

* Bath-on-the-Hudson, 25 0 Albany
* Keelwood, 25 0 Albany.

* Minisink, Orange Co., 15 1 Port Jervis.

NORTH CAROLINA.

| | | |
|------------------|------------------|----------------|
| 905 Alexander. | 173 Newton. | 98 Whiteville. |
| 125 Laurel Hill. | 141 Rowan Mills. | |

* Falkland, 25 2 (25 1 N. M. rate), Tarboro.
* Pictou, 40 3 (30 2 N. M. rate), Tarboro.

NOVA SCOTIA.

| | |
|-----------------|---------------|
| 2 Albion Mines. | 2 Sherbrooke. |
|-----------------|---------------|

* Baddeck, 25 2 North Sydney.
* Ingonish, 25 2 North Sydney.

OHIO.
 221 Alvada. 180 Fair Grounds. 232 Osgood Sta.
 221 Alverdston. 202 Hadley Junction. 252 St. Johns.
 170 Park n. 221 Luckey. 159 Strasburg, Stark
 151 Brilliant. 221 McComb. Co.
 180 Oreston. 221 McClure. 213 Storms.
 180 Everett, Summit 180 New Berlin, Stark 213 Wheelersburg.
 Co. Co. 180 West V. ew.
 234 Yorksh. re.

• De Kalb, 25 2 Mansfield.
 • Hartsville, 15 1, Minerva.
 • Hayville, Ashland Co., 15 1 by telephone, Ashland.
 • Jeromesville, 15 1 by telephone, Ashland.
 • Middle Branch, 15 1, Minerva.
 • Mogadore, 15 1, Minerva.
 • Monroe Centre, 20 1, No. Kingsville.
 • New Hazelton, 15 1, Minerva.
 • North Benton, 25 2 Braceville.
 • Osnaburg, 15 1, Minerva.
 • Pierpont, 25 2 No. Kingsville.
 • Poland, five by telephone, Youngstown.
 • Red Lion, 15 1 by telephone, Franklin.
 • Robertsville, 15 1, Minerva.
 • Sherodsville, 15 1, Minerva.

OREGON.
 795 Beaverton. 795 Whites.
 785 Cascade Incline.

• Airline (N. M.), 50 2, Portland.
 • Blue Mountain, 50 2 by telephone, Walla Walla, W. T.
 • Fort Klamath, 50 3, Ashland.
 • Linkville, 50 3, Ashland.
 • Milton, 50 5 by telephone, Walla Walla, W. T.
 • Weston, 50 5 by telephone, Walla Walla, W. T.

PENNSYLVANIA.
 84 An's Fort. 93 Jackson Summit. 130 Sheffield Depot.
 59 Berwyn. 131 June Bug. 54 Snyderstown.
 130 Claradon Depot. 94 Lewistown Juno. 111 Bogbird.
 140 Coraica. 140 Lucinda Station. 140 B. & A. Junction.
 53 Cresco, Monroe 59 Lusen, Ck. Nor- Ck. Mercer.
 53 Dunmore Ck. 84 Mainville. 130 Thompsons, War-
 53 Dunmore. 84 Mount in Grove. ren Co.
 129 Kit Lick. 140 Nesbannock Falls. 150 Union City Depot.
 151 Etna, Allegheny 58 Rowland's. 59 Virginsville. Ch.
 Co. 76 Richland. Ck. Moosalem.
 140 Evansburg, But- Sheridan L. b. 140 Volant.
 ler Co. 94 St Thomas. 130 Warren Depot.
 151 Fallston. 111 Seaboard. 151 Wilkinsville.
 84 Grafton Ck. 59 Shesby, tariff 151 Willow Grove.
 59 Grafton Ck. same as Qua- Allegheny Co.
 59 Grafton Ck. kerton, Ck. 140 Wilmington.
 59 Grafton Ck. Quakertown. 140 Zellenopolis.

• Academy Corners, 15 1 by telephone, Lawrenceville.
 • Alms House, 10 1 Allentown.
 • Balliettsville, 10 1 Allentown.
 • Best eta, 10 1 Allentown.
 • Centre Point, 10 1 Allentown.
 • Centerville, Elk Co., free, by telephone, Seaboard.
 • Churchville Berks Co., 10 1 Allentown.
 • Clayton, 10 1 Allentown.
 • Corning, 10 1 Allentown.
 • Cowanesque Valley, 20 1 by telephone, Lawrenceville.
 • Dillingersville, 10 1 Allentown.
 • Elmer, 20 1 by telephone, Lawrenceville.
 • Eagleville, 10 1 Allentown.
 • Fairview, Montgomery Co., 10 1 Allentown.
 • Fagleyville, 10 1 Allentown.
 • Franklin, Lehigh Co., 10 1 Allentown.
 • Gertsville, 10 1 Allentown.
 • Harrison Valley, 20 1 by telephone, Lawrenceville.
 • Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.
 • Ironton, 10 1 Allentown.
 • Limerick Square, 10 1 Allentown.
 • Lower Milford, 10 1 Allentown.
 • Neffa, 10 1 Allentown.
 • Nelson, 10 1 by telephone, Lawrenceville.
 • New Berlin, 10 1 Allentown.
 • Overbrook, free by telephone, Merion Sta., Montg'y Co.
 • Pleasant Corner, 10 1 Allentown.
 • R. d Hill, 10 1 Allentown.
 • Richaville, 10 1 Allentown.
 • Saegerville, 10 1 Allentown.
 • Schnecksaville, 10 1 Allentown.
 • Slatedale, 10 1 Allentown.
 • Trappe, 10 1 Allentown.
 • W. Milton 25 1 Milton.
 • Yellow House, 10 1 Allentown.
 • Zionsville eta., 10 1 Allentown.

QUEBEC.
 Beauce Juno. Hulet Landing.
 Buier. St. Alphonse de la Grand
 Etia. Boie.
 • Auherat Harbor, Magdalen Islands, 75 5 No. Sydney N.S.
 • Etang du Nord, Magdalen Islands, 75 5 No. Sydney, N.S.
 • Grande La e, Magdalen Islands, 75 5 North Sydney, N.S.
 • House Harbor, Magdalen Islands, 75 5 No. Sydney, N.S.

RHODE ISLAND.
 • Barrington, 25 0 by telephone, Providence.
 • O. spatchet, 25 0 by telephone, Providence.
 • Humilton, 25 0 by telephone, Providence.
 • Wrennam, 25 0 by telephone, Providence.

SOUTH CAROLINA.
 146 Jacksonboro. 146 Ravens.
 TENNESSEE.
 292 Bellevue. 292 White Bluffs. 340 Witha.
 183 Union Depot. 215 Whitesburg.

TEXAS.
 652 Albany. 495 Cuero (South). 657 Sierra Blanca (So.).
 651 Alexander. 670 Encinal (South). 648 Trinity Mills.
 656 Antelope (South). 480 Forest. 670 Twohig (South).
 659 Atascosa (South). 654 Atan (South). 470 Wayne.
 479 Bagwells. 470 Lodi. 671 Webb (South).
 657 Boracho (South). 655 Metz (South). 500 West.
 652 Bremen. 489 Margaret. 657 Wildhorse (South).
 670 Catulla (South). 654 Ojessa (South). 483 Winona.
 657 Cariso Pass (So.). 659 Pearall (South). 489 Wharton.
 485 Clear Creek. 656 San Martin (So.).

• Aguilera, 50 3 Corpus Christi.
 • Benavides, 40 3 Corpus Christi.
 • Kounts, 35 2 Beaumont.
 • Los Angeles, 50 3 Corpus Christi.
 • Pena, 40 3 Corpus Christi.
 • Realitos, 40 3 Corpus Christi.
 • Salado, 40 3, Austin.
 • San Diego, 40 3 Corpus Christi.
 • Village, 40 2 Beaumont.

VERMONT.
 27 Miles Pond. Ck. St. 31 Pompanoosue.
 Johnsbury. 39 South Wallingford.
 27 Passumpsic.

• E. Rupert, 15 2 Factory Point.
 • Guilford, 10 0 by telephone, Brattleboro.
 • Hartwellville, 20 1 by telephone, No. Adams, Mass.
 • Jacksonsville, 15 2 by telephone, No. Adams, Mass.
 • North Stamford, 15 1 by telephone, No. Adams, Mass.
 • Readsboro, 20 1 by telephone, No. Adams, Mass.
 • Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
 • Readsboro, 25 2 by telephone, No. Adams, Mass.
 • Stamford, 15 1 by telephone, No. Adams, Mass.
 • Wells, 15 2 Factory Point.
 • West Dover, 25 0 by telephone, Brattleboro.
 • Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.
 128 Afton. 143 Cascade. 95 Pl ins.
 188 Clifton Forge. 182 New River Depot. 163 Roanoke.
 • Indian Rock (N. M.) 40 3 Richmond.
 • Lairds, (N. M.), 40 3 Richmond.
 • Lee Hall, 30 2 Richmond.
 • New Market, Nelson Co., (N. M.) 25 2 Richmond.
 • Hillsbury, (N. M.), 40 3 Richmond.
 • Wilton (N. M.), 50 3 Richmond.
 • Yorktown, 45 3 Richmond.

WASHINGTON TERRITORY.
 7-4 Carbonado. 722 So Texas. 784 White River.
 774 Skagit City. 735 Touchet.

WEST VIRGINIA.
 • Coalmont, (N. M.) 30 2 Greenbrier, W. S. Spgs. or 45 3
 Huntington.
 • Talcott (N. M.) 25 2 Greenbrier, W. S. Spgs. or 50 3 Hun-
 tington.

WISCONSIN.
 345 Barneveld. 325 Jefferson Juno. 325 Sullivan.
 306 Calhoun. 356 Livingston. 362 Superior Juno.
 325 Cottage Grove. 325 London. 339 Summit Lake.
 3-6 Dousman. 306 No Greenfield. 360 Tunnel City.
 352 Hayward. 347 Kundolph. 355 Turtle Lake.
 339 Kemper. 306 Spring Meadow. 306 Wa. ca.
 • Sturgeon Bay Canal, 25 2 Horns Pier.
 • St. Josephs Pier, 2 2 Horns Pier.

WYOMING.
 573 Fossil. 551 Harper.
 NORVIN GREEN,
 President.

THE FIRST TELEGRAPH LINE IN FLORIDA

ACCORDING to the Pensacola Gazette the first telegraph line in West Florida was constructed from Pensacola to Blakely, and was put up mostly on trees along the mail coach road. The line crossed from Blakey, Alabama, to Mobile by cables and on poles along the marsh. It was completed and operated first in the month of January, 1860, and was known as the Pensacola Telegraph Company.

PROPOSALS FOR COAL

The WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Monday, March 27th, 1882, for 1,000 gross tons "Old Company's" Lehigh Nut Coal, to be delivered, as required, at the rate of about 150 tons per month, the first delivery to be made about the 10th day of April, 1882.

The coal to be delivered and stored in the vaults corner Broadway and Dey Street, before 9 A. M. and after 5 P. M.

A cargo of 150 to 175 tons may be delivered at one time, if more convenient for the contractor, or it may be delivered in small quantities.

If delivered by cargo, a bill of lading must be attached to the invoice, showing it to be "Old Company's" Lehigh.

A certificate, sworn to by a weigher, that the weights are correct, must accompany all invoices.

Proposals for any other than "Old Company's" Lehigh will not be considered.

Bills to be paid between the 15th and 25th of the month following the deliveries. The right is reserved to reject any and all bids, or to accept any one which may seem for the best interest of the Company.

The party whose tender is accepted may, at the option of the Company, be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Terms should be sealed and addressed to undersigned, endorsed

"PROPOSALS FOR COAL."

WM. HUNTER,
 Sup't Supplies.

New York, March 13, 1882.

SHORTHAND Writing thoroughly taught
 Situations procured for pupils when competent
 and for circular W. G. CHAFFEE, Oswego, N. Y.
 I will teach any operator the Corresponding Style of Phonography who will sell a Calligraph for me.

CEDAR TELEGRAPH POLES,

50,000 for SALE, by

H. C. RIPLEY,
 East Saginaw, Mich.

WANTED.

A young lady would like position as Telegraph Operator. Several years experience in small office. No Sunday work. Address "X" 1119 E. Grand st., Elizabeth, N. J.

HOW TO BECOME A PROFICIENT TELEGRAPH OPERATOR.

JUST PUBLISHED—THE NEW TEXT BOOK,

Commercial and Railway TELEGRAPHY

IN THEORY AND PRACTICE:

Arranged in questions and answers, 112 pages, 32 sections, illustrated; compiled and prepared by J. P. AB. REXLEY, Supt. Telegraph, Cleveland, O., to whom all orders should be addressed.

In the preparation of this book much valuable information has been carefully selected from a large amount of material gathered together from official sources, as well as from the experience of efficient operators in all grades of service. And that regarding Railway Telegraphy has been derived from official as well as from other reliable sources in connection with the most prominent railways in this country. Although brief, the work has been carefully prepared and made as complete, comprehensive and practical as possible.

Price 75 cents, or 3 copies to one address, \$2.00, sent post-paid on receipt of price. List of contents sent on application.

GREAT REDUCTION

PRICES

PINS & BRACKETS.

WE ARE NOW PREPARED TO FURNISH

Pins Plain.....\$10.00 per thousand.

Pins Painted..... 11 00 " "

Brackets Plain..... 13 00 " "

Brackets Painted..... 15 00 " "

Best quality of Oak. Special Discount on large orders.

L. B. HARRIS,

MANCHESTER, N. H.

THE

BROOK'S PATENT INSULATORS

WERE AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1867

At the Vienna Exposition, 1873

At the Cincinnati Industrial Exposition in 1874

And at the Centennial Exposition at Philadelphia in 1876.

MANUFACTURED AND FOR SALE BY

DAVID BROOKS,

22 North 21st Street, Philadelphia.

Operators' Cramps cured by

LITTLE GIANT FRENCH BATTERY

Relieves Rheumatism
 and all Nervous Com-
 plaints. Supersedes all
 others. Send for circular.
 C. E. JONES & BRO.
 Cincinnati, Ohio.

Digitized by Google

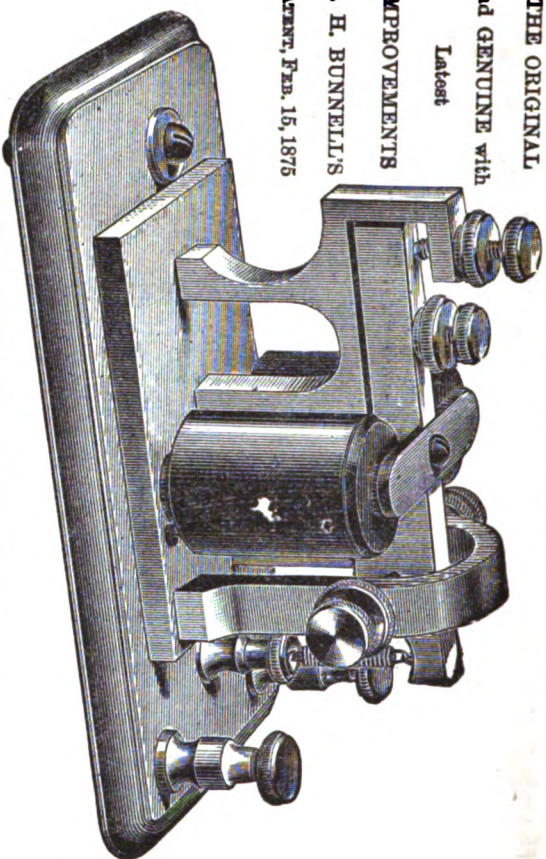
J. H. BUNNELL & CO.'S FIRST CLASS TELEGRAPH MACHINERY.

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS

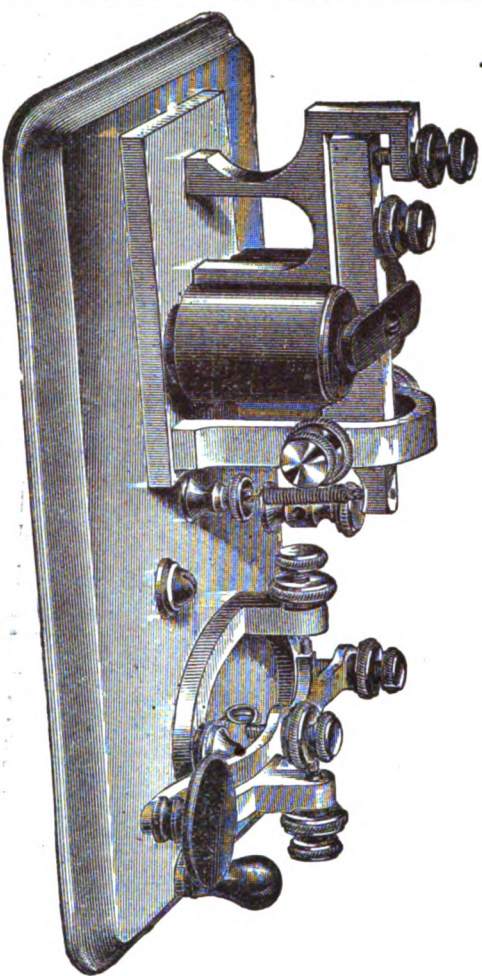
J. H. BUNNELL'S

PATENT, FEB. 15, 1875



THE GIANT SOUNDER—UNEQUALLED!

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$6.00, carefully boxed and sent by mail, prepaid, to any part of the United States.

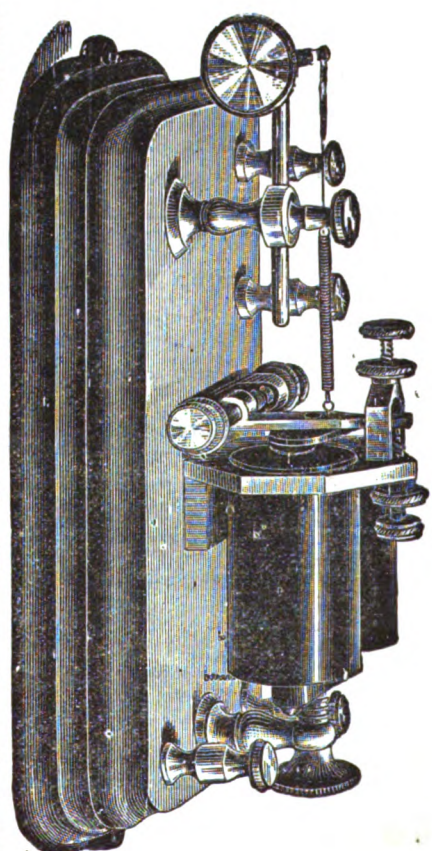


GIANT SOUNDER, (30 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET:

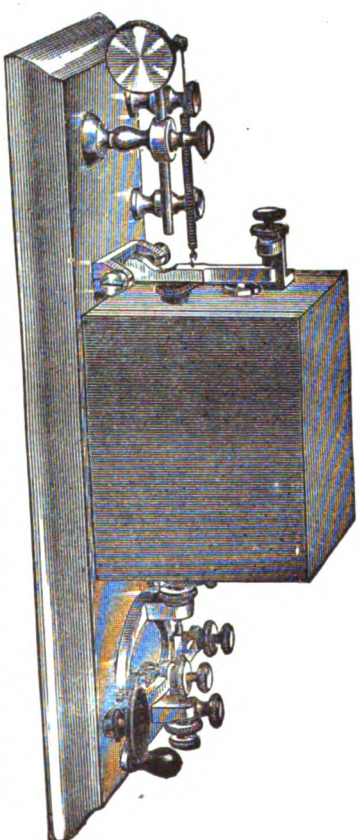
For Private Wires, Main Lines, etc., up to 25 miles in length.—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 30 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$8.00, carefully boxed and sent by mail, prepaid, to any part of the United States.

All of these prices subject to liberal discount on orders in quantity.



FIRST-CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Stand, Extension Adjustment. Price, \$8.50.



BOX SOUNDING RELAY AND STEEL LEVER KEY.

COMBINATION SET.

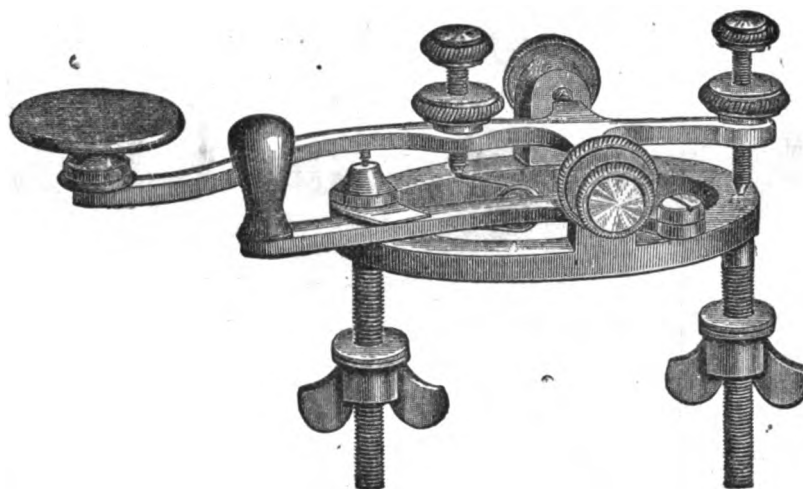
For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$12.00; without Key, \$9.00.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:


The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

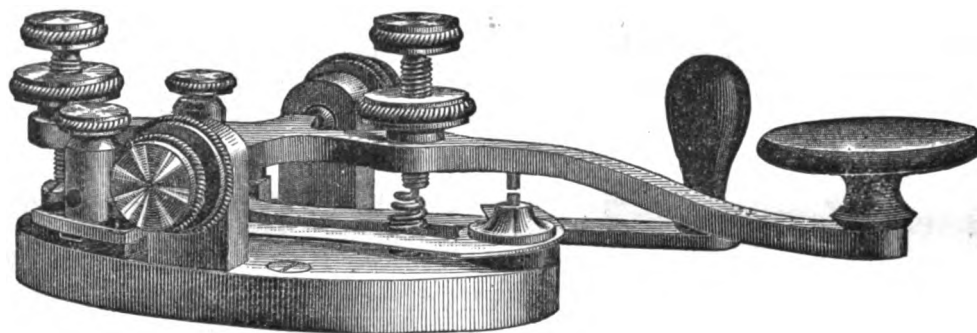
The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Legless Pattern Steel Lever Key.



A BEAUTIFUL AND PERFECT KEY,

Suitable for Use on Fine Desks, or Wherever a Legless Key is Preferable.

PRICE, Carefully boxed, and sent, prepaid, by mail to any part of the United States, **\$4.00.**

 **BUNNELL & CO., 112 LIBERTY STREET, NEW YORK.**

CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells, District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS.

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

GEO. WENZINGHOUSE, Jr. Pres. RAPHAEL BAGLEY, V. Pres. & Treas.

C. H. JACKSON, Gen'l Manager. ADAM T. ROWLAND, Secretary.

HENRY SWIDER, General Agent.

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
sole Owners and Manufacturers of the only practically successful

SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches,
Signals and Gates by Levers, Hydraulics, Pneumatics or Electricity.

Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.

Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnished
upon application.

ESTABLISHED 1830.

ALFRED F. MOORE,

(SUCCESSOR OF JOSEPH MOORE & SONS)

MANUFACTURER OF

INSULATED TELEGRAPH WIRES,

300 & 302 North Third St., corner of Race,

PHILADELPHIA, PA.

INSTRUMENT AND OFFICE WIRES. FLEXIBLE CORDS. ANNUNCIATORS

AND BURGALAR ALARM WIRES. ELEVATOR CABLES.

All wire used is thoroughly tested for conductivity, therefore
ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP,

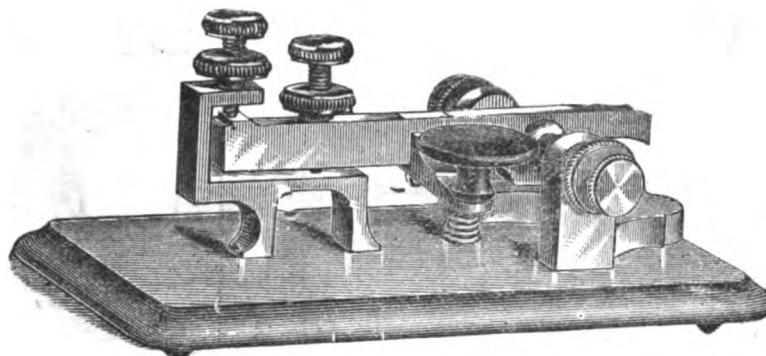
FOR FLEXIBLE CORDS.

Descriptive Circulars furnished upon application.

NEW MECHANICAL

TELEGRAPH INSTRUMENT.

PATENT APPLIED FOR.



COMBINED KEY AND SOUNDER.

No BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is *always ready for use*.

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or registered
letter.

J. H. BUNNELL & CO.,

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

ILLUSTRATED CATALOGUES

OF NOVEMBER, 1881?

If not, send your address by postal card or letter and you will get one by return mail

IT CONTAINS

Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instruments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

Don't Read This! Or you will BE SURE to send for our NEW 1882 CATALOGUE, which is proper and to your interest to do before purchasing elsewhere. If you want to be a TELEGRAPH OPERATOR send twenty-five cents for our NEW 1882 ILLUSTRATED INSTRUCTION BOOK. It is the MOST COMPLETE instruction book in the world. C. E. JONES & BRO.: Dear Sirs:—Instruction Book received O. K., and many thanks. It is worth five times what it cost. If a person could not learn to be an operator after studying it, they had better give up. Yours truly, A. L. JAMES, Tipton, Tulare County, Cal.

Now! Right Now! while fresh in your mind, is the best time to send your order, before you misplace this paper and forget our address, and your opportunity is gone. Remittances preferred in currency, 1c. or 2c. stamps.

C. E. JONES & BRO.,
MANUFACTURERS AND DEALERS IN
TELEGRAPH, TELEPHONE AND ELECTRICAL SUPPLIES.
NO. 51 WEST FOURTH STREET, CINCINNATI, OHIO.

WESTERN ELECTRIC MANUFACTURING COMPANY.

280-282 KIRK STREET, CHICAGO.

62-68 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES.

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Marine Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

AMOS STAGER, President, ENOS M. BARTON, V.-Presd.

ELIENNA GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE. |
|---|--------|--------|
| I—Complete Set of Catalogues..... | 295 | 20c. |
| II—Telegraph Instruments and Supplies..... | 64 | 6c. |
| IV—Insulated Wire (included in II) | | |
| V—Electric Bells, Annunciators, Electro-Marine Fire Alarm..... | 23 | 2c. |
| VI—Electro-Medical Apparatus..... | 23 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 23 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 13 | 2c. |
| XI—Magnets for Mills..... | 20 | 2c. |
| Str Wm. Thomson's Nautical Instruments... | 24 | 6c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,

AND

PLAIN AND OILED WIRE OF SUPERIOR QUALITY,

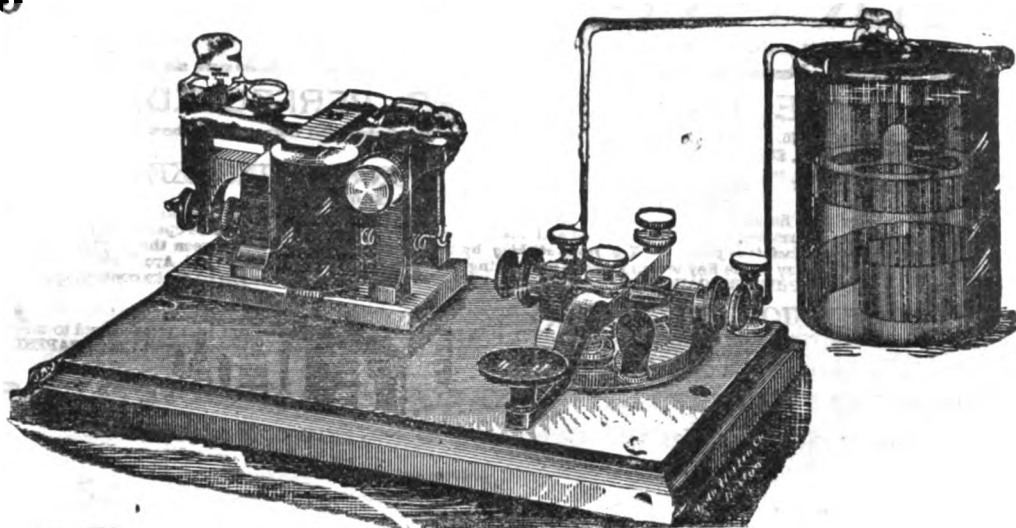
FROM SWEDISH CHARCOAL AND B. B. IRON.

BUT ONE JOINT PER BUNDLE.

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT



PRICE FOR THE COMPLETE "GEM" LEARNERS' OUTFIT, \$4.20.

Consisting of the above large-sized Sounder and Key, a good Cell of Calland Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument made that has nicely finished brass Sounder and Key Levers with perfect adjustments for both.*

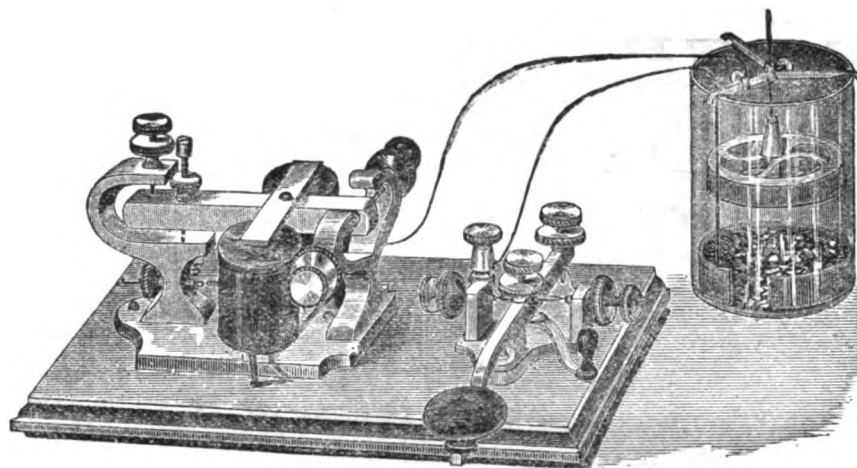
| | | | |
|---|--------|---|--------|
| Price for Complete Outfit..... | \$4.20 | Price for Instrument alone, for 1 to 15 miles.. | \$4.00 |
| " " Instrument alone | 2.40 | " " " " " " " " | " " |
| " " Instrument alone, by mail, postpaid ... | 4.00 | by mail, postpaid..... | 4.5 |

SEND FOR CIRCULAR.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,

No. 80 HANOVER STREET, BOSTON, MASS.



No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of Sounder, Key, either on 1 base or separate, 5x7, Calland Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent C. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

A. B. LYMAN, 36 South Water St., Cleveland, O.

PARTRICK & CARTER

TELEGRAPHIC SPECIALTIES.

THE GIANT SOUNDER PERFECTED.

Patented Feb. 16, 1875. Most perfect, reliable, clear toned; fine finish, and warranted the best working sounder in existence. Price, by mail, \$4.00.

THE "LATTIG" AUXILIARY LEVER NON-STICKING KEY.

PATENTED AUGUST 16, 1891. PRICE, \$4.00, BY MAIL.

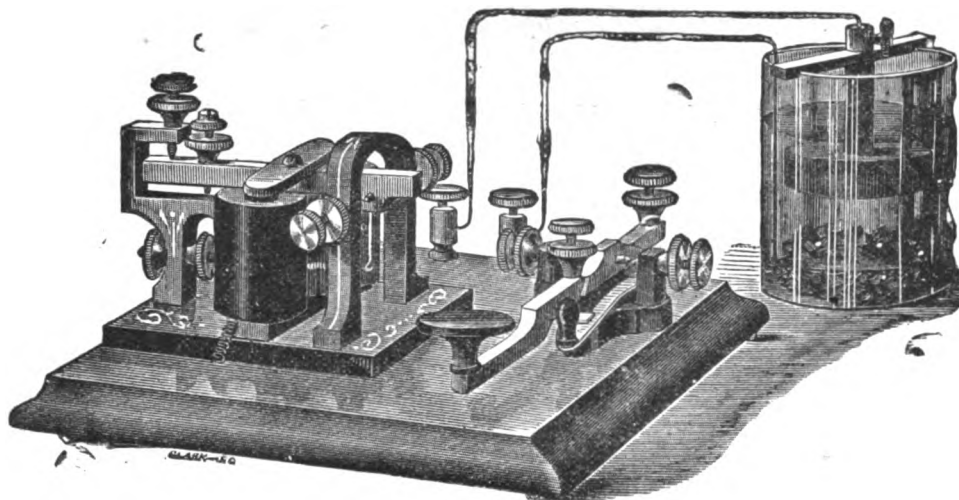
This Key is very fine finish nickel-plated, and presents a beautiful appearance, is easy to handle and WARRANTED NEVER TO STICK. It has been extensively tried and has received the endorsement of the best operators in the country. It embodies the only true principle to prevent a Key from sticking by having a great separation between the anvil and hammer, (without increasing the play of the Key lever,) thereby preventing the formation of the "Electrical Arc" between the platina points, which is the PRIMARY CAUSE of SLOWING KEYS. We claim this Key will never fail to make contact.

"THE EXCELSIOR KEY." (PATENT APPLIED FOR.) PRICE \$2.50 BY MAIL.

This Key is made ENTIRELY OF BRASS NICKEL PLATED, with hardened platina points, and it is put forward to meet the long existing demand for a CHEAP, LIGHT, EASY WORKING, FIRST CLASS KEY, and is without doubt the CHEAPEST and BEST Key EVER OFFERED FOR THE MONEY.

Premium Learners' Apparatus.

Only \$5.00. Not the Cheapest, but Guaranteed the Best.



The PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER, PERFECTED," and "NEW CURVED KEY," placed upon a splendidly polished base, with a coil of Galvanic Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5.00, when the money accompanies the order. The great number of these Instruments use is the best testimonial that can be offered.

Price, Complete Outfit Money in advance, \$5.00
 " Instrument without Battery " " 4.30
 " Instrument without Battery, by Mail " " 4.75
 Remittances should be made by P. O. Money Order, Registered Letter, Draft or Express, which will insure safe delivery. Send for circulars.

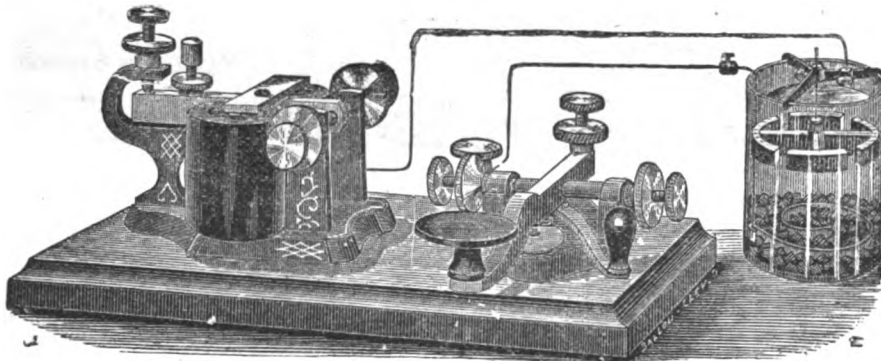
PARTRICK & CARTER,

No. 114 SOUTH SECOND STREET, PHILADELPHIA, PA.,

Manufacturers and Dealers in TELEGRAPH, TELEPHONE, AND ELECTRICAL INSTRUMENTS AND SUPPLIES OF EVERY DESCRIPTION. Send for Catalogues and Circulars.

SEND FOR OUR PRICES BEFORE PURCHASING ELSEWHERE.

EUREKA OUTFIT NO. 2.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

THE ABOVE OUTFIT AND MATERIAL ALL COMPLETE SENT ON RECEIPT OF \$4.25.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

Room 19, Leader Building, Cleveland,

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

2,164 MEMBERS. \$21,640 RESERVE FUND.

The Association respectfully invites attention to its success during the past ten years, having paid to its beneficiaries over \$175,000, and accumulated a reserve fund of \$21,640, interest upon which nearly pays current annual expenses. No officer or agent draws salary or commission. Average annual assessments to each member has been less than \$12.

Any person, of either sex, in good health of not less than 18 or more than 45 years of age, who is employed in telegraphic service, and is otherwise qualified as required by the By-Laws, is eligible to membership; and should a member in good standing leave the Telegraphic Service, but continue to pay all dues assessed and otherwise conform to the Constitution and By-Laws, he can retain his membership.

The initiation fee is \$3. \$1,000 will be paid to the beneficiary of a deceased member within 60 days after verification of claim; and in the case of a member who has been one year, next preceding date of death—in good standing the claim is indefeasible.

Any one who is or becomes a member in good standing of this Association is also eligible to membership in the new or Second Division. For further information, copies of Constitution and By-Laws, blank applications, etc., apply to any of the following named officers or agents:

OFFICERS:
 CLARENCE CARY, President. O. H. SUMNER, Vice-President.
 A. E. BREWER, Secretary. SAMUEL M. TAYLOR, Treasurer.
EXECUTIVE COMMITTEE:
 CLARENCE CARY, New York. O. H. SUMNER, Chicago, Ill.
 A. E. BREWER, New York. SAMUEL M. TAYLOR, New York.
 W. H. YOUNG, Washington, D. C. F. W. JOHNS, New York.
 JOHN E. KNEBLIN, Phil. Pa. CHARLES S. H. SMALL, New York.
 JAMES MERRICK, New York.

AUDITING COMMITTEE:
 H. C. ROBINSON, Philadelphia, Pa. T. F. SCULLY, New York.
 R. W. FORB, New York.

AGENTS:
 Albany, N. Y. Charles C. King.
 Augusta, Ga. John W. Brown.
 Atlanta, Ga. J. M. Stephens.
 Baltimore, Md. R. J. Borcham.
 Bangor, Me. O. E. Elm.
 Bismarck, Dak. Chas. F. V. Draper.
 Boston, Mass. B. B. Pillsbury.
 Buffalo, N. Y. J. W. Tillingham.
 Cheyenne, W. T. Chas. F. Annett.
 Cincinnati, Ohio. G. W. Sheppard.
 Chattanooga, Tenn. Charles H. Shelton.
 Charleston, S. C. J. D. Besterlin.
 Chicago, Ill. J. Udry.
 Cleveland, Ohio. H. I. Minton.
 Columbus, Ohio. A. M. Paddock.
 Denver, Col. W. A. Adams.
 Dubuque, Iowa. F. I. Benson.
 Detroit, Mich. T. W. Hill.
 Elkhart, Ind. S. F. Wilcox.
 Evansville, Ind. H. M. Booth.
 Grand Rapids, Mich. E. D. Benedict.
 Galveston, Texas. David Hall.
 Graton, W. Va. A. T. Oline.
 Harrisburg, Pa. H. A. Crute.
 Halifax, N. S. Alex. H. Hoyt.
 Hartford, Conn. S. E. Curtis.
 Indianapolis, Ind. F. A. Moore.
 Jackson, Mich. D. S. Fleming.
 Jackson, Tenn. Nelson R. Jacobs.
 Kansas City, Mo. M. D. Wood.
 La Fayette, Ind. H. M. Doolittle.
 Little Rock, Ark. E. C. Newton.
 Louisville, Ky. Charles Smith.
 Mobile, Ala. B. F. Shreve.
 Montgomery, Ala. E. E. Conley.
 Milwaukee, Wis. D. H. Adams.
 Montreal, Quebec. James Kent.
 Nashville, Tenn. A. H. Stewart.
 New Haven, Conn. J. M. Fairchild.
 New Orleans, La. J. T. Allen.
 No. Sydney, C. B. Nath'l Martell.
 New London, Conn. G. W. Russell.
 N. Y., L. Erie & W. R.R. (At Cortlandt St. N. Y.) C. D. Reed.
 Oil City, Pa. Frank Ross.
 Omaha, Neb. L. M. Rheam.
 Philadelphia, Pa. Wm. G. Jones.
 Philadelphia, N. J. G. H. Graw.
 Peoria, Ill. J. B. Hammatt.
 Pensacola, Fla. C. L. Le Sueur.
 Pittsburgh, Pa. J. E. Palmer.
 Poughkeepsie, N. Y. M. E. Ruple.
 Portland, Me. O. D. Livermore.
 Portland, Oregon. D. F. Leahy.
 Providence, R. I. Jas. S. Hall.
 Reading, Pa. W. H. Hanson.
 Richmond, Va. W. C. Walstrom.
 Rochester, N. Y. A. J. Macdonell.
 Reno, Nevada. Frank H. Macdonell.
 Sayre, Pa. H. A. Macdonell.
 Scranton, Pa. E. O'Brien.
 Syracuse, N. Y. Luther G. Field.
 St. John, N. B. R. T. O'Brien.
 St. Louis, Mo. Geo. W. Brownson.
 St. Paul, Minn. Day E. Smith.
 San Francisco, Cal. A. P. Dubois.
 Savannah, Ga. H. Griffith.
 Springfield, Mass. W. J. Deaver.
 Springfield, Ill. W. W. Keckhe.
 Toronto, Ont. J. Lanskill.
 Troy, N. Y. F. D. Adams.
 Toledo, Ohio. J. P. Church.
 Vincennes, Ind. Perry Hood.
 Washington, D. C. W. E. Young.
 Wheeling, W. Va. Jno. G. Tomlinson.
 White River Junction, Vt. G. W. Gates.
 Welleville, Ohio. F. Bruner.
 Worcester, Mass. E. W. Bradford.
 Watertown, N. Y. D. Van Nostrand.

A. R. BREWER, Sec'y.

P. O. Box 3175. New York.
 W. U. T. Bunsen, Room 58.

LECLANCHE BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order. Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company,
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones.

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Pilaques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of IMITATIONS and WORTHLESS IMITATIONS.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity Zinc and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,
40 West 18th St., New York.

Or L. G. TILLOTSON & CO.,
5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FIBERS

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

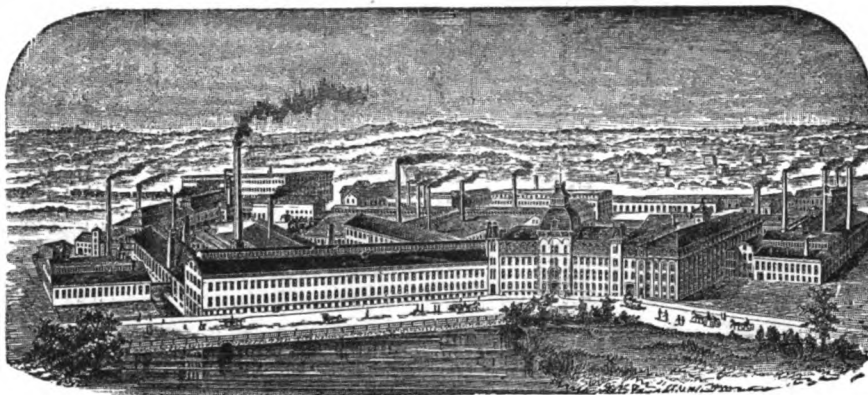
LEAD-ENCASED WIRE, CABLES, ETC.

OFFICE AND FACTORY: 67 STEWART STREET,
PROVIDENCE, R. I.

W. H. SAWYER, Electrician and Sup'l

TELEGRAPH WIRE.**WASHBURN & MOEN MANUFACTURING COMPANY.**

REMARKABLE 1881. CAPITAL \$1,500,000.

**WORCESTER, MASS.**

21 CLIFF STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequaled in that particular.

Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

(In connection with the DOUGLAS BREKERS FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

R. R.—The qualities known as Extra Best Best (R. R. B.) and Best Best (R. R.), kept constantly in stock.

KERITE INSULATED**TELEGRAPH WIRES AND CABLES**

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession

THE

DURABLE QUALITIES OF KERITE

RECOMMENDED BY AN ARMY

CHEAPEST AND MOST ECONOMICAL

Insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation furnished at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

Further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

J. H. Houshman, General Agent,

TELEPHONE WIRE.**THE AMERICAN
BELL TELEPHONE COMPANY.**

W. H. FORBES, President, W. K. DRIVER, Treasurer,
THOS. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with one of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEM

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purpose, for which instruments will be leased for a term of years at a nominal rental.

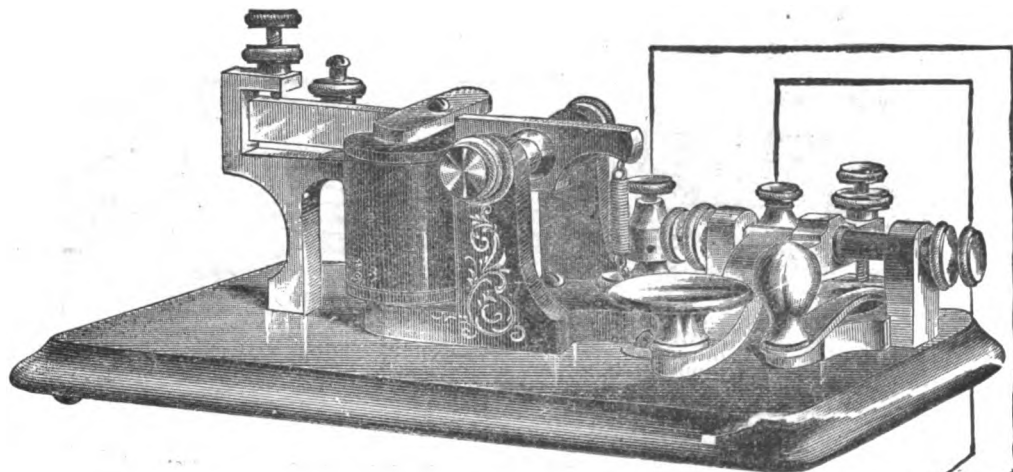
This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

NOTE: All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

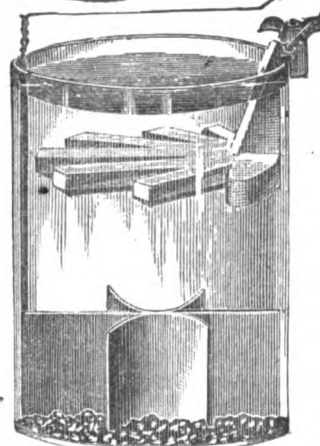
The "Morse" Learners' Instrument.



THE BEST.

Price, \$450, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.
 "Morse" instrument alone, without battery..... \$3.80
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 4.50
 Cell of battery complete..... .65
 "Morse" Learners' Instrument, without battery, sent by mail..... 4.30
 (Battery cannot be sent by mail.)

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.
 Remit by Draft, Postal Money Order, or Registered Letter.
 Favorable arrangements made with Agents everywhere.



THE BEST.

THE "MORSE"

Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners' Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

You are **SURE** of getting
 THE BEST THAT IS MADE
 IF YOU SELECT THE "MORSE."

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.



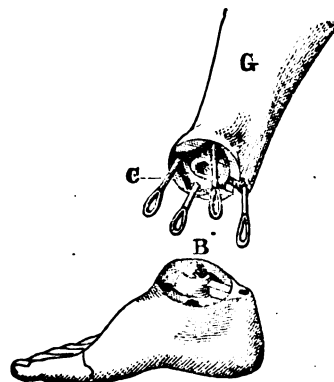
YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "78," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 either designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys, Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents; also Embellished Keys 25 for 25 cents. Samples of Operators' Cards 10 cents. 50 New and laughable Illustrations, from Flirtation to Marriage, see out above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 20c. 25 side-spitting Comic Cards, 2c. Morocco card cases, two pockets, 10c. 180 finely printed letter heads, \$1.00. 10 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 10c. Agents Wanted to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, out in all styles and shapes, also sat n fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and Flipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200 no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from 3 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address, F. P. MUNN, CLYDE, Wayne Co., N. Y.

WESTERN UNION TELEGRAPH COMPANY,
 NEW YORK, March 8, 1882.
 DIVIDEND No. 59.

The Board of Directors have declared a quarterly dividend of ONE AND ONE-HALF PER CENT. upon the capital stock of this company from the net revenues of the three months ending March 31st, instant, payable at the office of the Treasurer on and after the 15th day of April next, to shareholders of record on the 18th day of March, instant. The transfer books will be closed at three o'clock on the afternoon of the 18th of March instant, and re-opened on the morning of the 17th of April next.

R. H. ROCHESTER, Treasurer.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
 With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.
 GEO. B. FULLER,
 Successor to Dr. D. BLY, Rochester, N. Y.

BEST TELEPHONE EXCHANGE SWITCH BOARD.

IN THE WORLD.

SUPERSEDING ALL OTHERS.
 Sample and Circulars sent to Exchanges on Application to
C. E. JONES & BRO.,
 CINCINNATI, OHIO.

WESTERN SCHOOL OF TELEGRAPHY.

JANESVILLE, WISCONSIN.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement, now of eight years standing, with the system of city lines in Chicago known as the Metropolitan Telegraph Company, having over 100 offices, and worked in connection with the Western Union Telegraph Company. These city lines draw their operators from this school, placing them first in sending offices and afterwards promoting them according to merit. The superintendents of telegraph of the different railroads centering at Chicago, employ many men from the city lines, and the Western Union Company does the same, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make of our students first class operators, nor to obtain for them first class situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

RICHARD VALENTINE, } MANAGER.
 A. M. VALENTINE, }

M. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have lately furnished the following Companies in this way: Wisconsin Central, Green Bay & Minn.; St. Paul, Wisconsin & Chicago; St. Paul, M. & Omaha and Burlington & Northwestern.

We can so furnish, on short notice, experienced operators competent to manage any ordinary office, and reliable in every respect.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, APRIL 20, 1882.

WHOLE NO. 346.

MAGNETIC DISTURBANCES, AURORAS, AND EARTH CURRENTS.*

By PROF. W. GRILLS ADAMS, F. R. S.

(Concluded from page 82.)

They were very violent on August 12, beginning at 11 30 A. M., the beginning of the second storm, and quieting down about 4.30 P. M., then beginning again at 7.30 and lasting until 9.30 P. M.

Again on the 13th they are strong for 1½ hours, from about 5 in the morning, i. e., just about the end of the second magnetic storm.

The general direction of the earth-currents as observed at Derby or Haverfordwest, as well as at Greenwich, was from northeast to southwest.

Again on January 31 last, another violent magnetic storm occurred, in which the currents were even more violent than in the August storm.

Intimately connected with magnetic disturbances and earth currents is the phenomenon of the aurora or polar light, which is an electric discharge in the upper regions of the atmosphere. During the August and January storms the aurora was well seen in England; it was also seen at St. Petersburg, and as far east as Siberia. It does not appear to have been seen, although it was looked for, at Zi-kia-wei, in China, by M. Dechevrens, the director of the observatory, although the magnetic storm was so violent there that the horizontal force was suddenly changed by one-one hundredth part of its total amount.

We may arrive at some idea of the character of the aurora by studying electric discharges in vacuum tubes, and Dr. De la Rue has already brought this subject before you in his Friday evening lecture.

We may gradually pass from electric discharges in air of ordinary density, in which we get the well known electric spark between two surfaces, to air of less density but better conducting power, and then to air of less density still, but of such high resistance that no electricity will pass. Dr. De la Rue has shown that with 11,000 cells of his battery the striking distance between two points is about six-tenths of an inch in air of ordinary density of about 760 mm. pressure.

When the pressure in a hydrogen tube is reduced to 21.7 mm., 8,937 cells will cause a discharge to take place through thirty inches.

When the pressure is reduced to 0.642 (about six-tenths of a mm.), 430 cells will cause a discharge through the tube.

When the pressure is still further reduced to 0.0065, it requires 8,937 cells to cause a discharge, so that the spark passes more readily at a pressure of 0.642 mm. than it does at a higher or a lower pressure. This is also the case with air.

The lower regions of the earth's atmosphere offer great resistance to the passage of electricity, but as

we ascend the pressure diminishes and the electric resistance diminishes, until at last, at a height of between thirty and forty miles, a level is reached where the air offers least resistance to the passage of electricity, where the pressure is about 0.397 of a mm., and above that level the electrical resistance again increases, so that at a height of about eighty miles the battery of 11,000 cells would not cause a spark to pass.

If we take the tube which has not been very highly exhausted we see that the light from the positive pole extends nearly through the tube, and the dark space around the negative pole is small. As the exhaustion proceeds and the pressure of the air is diminished, the electric spark passes through greater and greater lengths and changes its character, until we get to the pressure corresponding to the least resistance. Beyond that the resistance increases, the dark spaces around the negative pole expands, and the molecules fly about more freely; those on the negative plate being charged with electricity, and being repelled from it, proceeds for a long distance in straight lines, and possess the power of causing bodies on which they strike to glow. In Mr. Crookes's tubes we get very beautiful effects from this glowing of the glass tube itself, or from the glowing of substances in the path of the stream. We may regard this as a stream of molecules of gas charged with electricity, and we see the difference between this stream and the electric current in a vacuum tube at lower exhaustion by the action of the magnet upon it. In one case the current going through the molecules from pole to pole in the tube is bent out of its course by the magnet, and symmetrically by the two poles, and returns to its path the line of least resistance, through the molecules, whereas the stream of molecules at the higher exhaustion, carrying their electricity with them, are carried away by the electric charge upon them, and get utterly lost and scattered on striking the side of the tube, yielding up a great deal of energy in the form of heat to the tube or to the glowing platinum or other substance in the tube.

I must now show you the beautiful aurora tube which has been seen once in this theatre, and for which I am indebted to the kindness of Dr. De la Rue. It has been brought to the right state of exhaustion to show just those effects, which will help better than any description of mine to give you an idea of the character of the aurora discharge in the middle regions of the atmosphere.

By bringing a magnet to bear upon this discharge we may see the effect of terrestrial magnetism on the aurora discharges in the atmosphere.

Aurora Borealis.—The aurora as seen in the north-eastern parts of Siberia, where it is often very brilliant, is described as consisting of single bright pillars rising in the north and in the northeast, gradually covering a large space of the heavens; these rush about from place to place, and reaching up to the zenith, produce an appearance as if a vast

tent was spread in the heavens, glittering with gold, rubies and sapphires.

More exact attempts have been made to describe the aurora, and perhaps I may be allowed to quote Dalton's description of an aurora as seen by him.

A remarkable red appearance of clouds was noticed in the southern horizon, which afforded light enough to read by, and a remarkable effect was expected. He says: "There was a large luminous horizontal arch to the southward, and one or more concentric arches northward. All the arches seemed exactly bisected by the plane of the magnetic meridian. At 10 31, streamers appeared in the S. E. running to and fro from W. to E.; they increased in number, and approached the zenith, when all of a sudden the whole hemisphere was covered with them, and exhibited such an appearance as baffles all description. The intensity of the light, the prodigious number and volatility of the beams, the grand intermixture of all the primitive colors in their utmost splendor, variegating the glowing canopy with the most luxuriant and enchanting scenery, afforded an awful, but at the same time a most pleasing and sublime spectacle. But," he adds, "the uncommon grandeur of the scene only lasted one minute. The variety of colors disappeared, and the beams lost their lateral motion, and were converted, as usual, into the flashing radiations; but even then it surpassed all other appearances of the aurora, in that the whole hemisphere was covered with it."

In his address before the British Association in 1863, Sir William Armstrong speaks of the sympathy between forces operating in the sun and magnetic forces on the earth, and notices a remarkable phenomenon seen by independent observers on September 1, 1859.

"A sudden outburst of light, far exceeding the brightness of the sun's surface, was seen to take place, and sweep like a drifting cloud over a portion of the solar surface. This was attended with magnetic disturbances of unusual intensity, and with exhibitions of aurora of extraordinary brilliancy. The identical instant at which the effusion of light was observed was recorded by an abrupt and strongly-marked deflection in the self-registering instruments at Kew. The magnetic storm commenced before and continued after the event."

The daily and yearly periods of the magnetic changes, the change in the horizontal force depending on the sun's rotation on his axis, the agreement of the eleven-year period of magnetic disturbances, sun-spots and aurora, show that the sun plays a very important part in causing or governing both the regular and irregular magnetic changes.

If the sun be assumed to be a very powerful magnet, then changes in his magnetism might be expected to effect the magnetism of the earth, although the effect could not be very large, unless the sun is magnetized to an intensity much greater even com-

pared to his mass, than the earth is magnetized. Then as there are tides in the sea around us and probably in the earth's crust, so there are certainly very large tides in the ocean of air above us; and may not the sun and moon, by dragging this air toward them as the earth revolves, cause that friction between air and earth, and also that evaporation, which together may account for the presence of, and keep up the supply of, positive electricity in the air and negative electricity in the earth? Again, these tides in the atmosphere will cause the mass of it to lag behind the revolving solid earth, and at a height of thirty or forty miles we have a layer of air which, for air, is a comparatively good conductor of electricity. Here, then, we have not a lagging of the magnet behind the conductor, but a lagging of the conductor behind the magnet, and hence, according to the laws of Faraday, we may expect a current, or a gradual heaping up of electricity in the air in the opposite direction to the current in the earth's crust. Thus the regular tidal waves in the atmosphere would cause the gradual transfer of positive electricity from the poles toward the equator. This transfer may be of the nature of a current of electricity or of a mass of air carrying a static charge of electricity with it, for, as Prof. Rowland has shown that the motion of a static charge will produce magnetism, so we may expect from the principles of conservation of electricity that a change in the position of a magnet will under such circumstances produce motion of the static charge of electricity. When the air becomes charged up to discharging point, then we may get the sudden discharges such as the aurora in the air and the earth current in the earth; and since the conducting layer of air approaches nearer to the earth in the colder polar regions, possibly within less than twenty miles of the earth's surface, it may be found that the discharge of the aurora may even take place from earth to air by gradual slow discharge, aided as it may be by the state of moisture of the air and by change of temperature and other causes.

ELECTRICAL PATENTS IN ENGLAND.

SOME idea of the extraordinary activity at present existing in the development of electrical science, and the practical application of electricity to various useful and industrial purposes, may be gathered from the following statistics, compiled by Messrs. J. K. Fahie & Son, of the Patent Offices, High Holborn, London, and Nassau Street, Dublin:—During the year 1881 it appears that no less than 237 applications for British patents were recorded in Her Majesty's Patent Office for inventions which may be classed under the head of *Electricity*. Of this grand total 135 emanate from British applicants, 52 from American citizens, and 50 from residents on the continent (France, Germany, Belgium, &c.). Classifying the total number of 237 applications under special heads, it appears that 93 specifications have been lodged for improvements in electric lamps, 20 for improvements in electric incandescent lamps, 38 for magneto and dynamo machines, 32 for secondary batteries, 26 for regulating, controlling, and measuring the electric current, 24 for miscellaneous appliances connected with electric lighting, and 4 for producing power and transmitting motion. Reviewing the names of the applicants for the above patents, it appears that the celebrated American inventor Edison stands highest on the list, having applied for no less than 24 patents for various electrical improvements; Messrs. Swan and Lane-Fox each filed 7 applications, mostly in connection with incandescent lighting, and M. Faure,

of Paris, 3 for secondary batteries, while Mr. Maxim filed 2 and Mr. Brush 1 for arc lighting apparatus. The above figures show what an astonishing amount of energy is now being brought to bear on the introduction of this wonderful science, and it will certainly not be the fault of inventors if electricity be not speedily reduced to a practical success, and made to serve in the immediate future purposes and ends of which we have little conception to-day.

THE TELEGRAPH APPLIED TO THE TYPE WRITER AND TO TYPE SETTING MACHINES.

A gentleman whose business is not telegraphy, but who is deeply interested in mechanical progress, has lately patented an invention, says the *N. Y. Herald*, which bids fair to supply the long missing link sought in the direction of printing a message as fast as it can be sent. The possible application of the invention is, however, by no means limited to this use; indeed, it is of such a nature as to admit of being the medium of communicating at will the desired impulse to any number of parts of an instrument or machine—or, to put it more clearly, of actuating at will the various parts of an inert mechanism. The patent office title of the invention is "Selecting Device;" the inventor is Mr. James Munson, of New York city. After an understanding of the chief feature of the invention its various applications can be readily deduced. Imagine a number of pins or small bolts of brass fixed horizontally by small coil springs to an upright plate, so that on the plate being pressed forward the pins would recoil a little on meeting with a resisting surface, such as another upright plate. If, however, there is a hole in the second plate opposite any one of the pins it will be seen that that pin will pass through the hole while the others will be arrested by the plate. This principle has for many years been applied in the famous Jacquard looms, by which we know the most complicated patterns and even pictures have been woven in colors. Mr. Munson in his specification refers to this application as follows:—

What is known as the "jacquard" mechanism in looms, contains a nest or series of thrust pins arranged in regular lines distributed over a considerable area of rectangular form. These thrust pins are held out with gentle force in the working of a Jacquard. They are, at every movement of the loom, all thrust out and, on being presented to a properly punched card, a portion are forced back and another portion are allowed to stand forward by reason of their meeting perforations instead of the solid body of the card. Each pin, being connected to one or more of the yarns of the warp, controls that portion of the weaving.

Mr. Munson then proceeds to point out the application which he makes of the principle. A single resisting plate, with a single hole in it, has for the purpose of illustration been used above. Mr. Munson places a number of such resisting plates or slides together with a number of variously placed holes in them. Referring to the jacquard nest or bank of thrust pins, he says:—

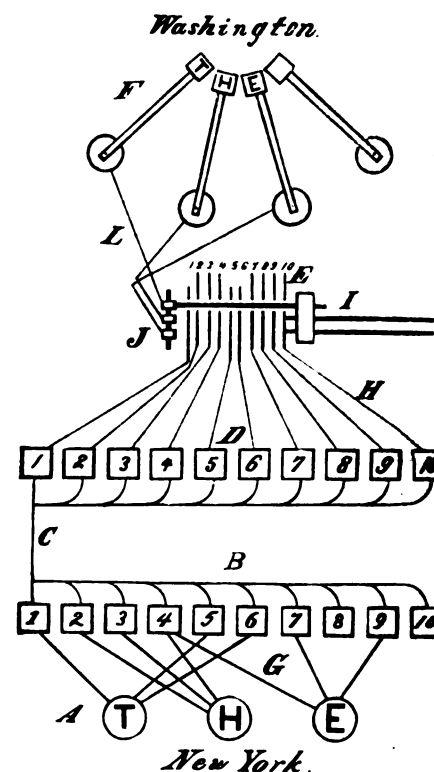
I use a similar bank of pins. Before each movement (of the mechanism actuating the slides or plates) all are moved forward. Then, by the operation of the machine, the whole are brought up against a surface formed of a number of movable cards or plates peculiarly punched. Unlike the cards of the jacquard loom my cards are superposed one upon the other and are ten in number. A number of holes are perforated in each.

DISTANCE PRINTING.

These holes are so distributed that upon each mo-

tion of the operating contrivance one perfect hole will be presented quite through the entire set of cards or plates, and only one. If, now, the thrust pin which passes through that hole establishes electrical contact with a wire leading to a magnet operating one of the levers of a type writer, it will be seen that the person operating the machine prints a letter in the type writer. If it be understood that there are eighty-four holes thus provided it will be understood that eighty-four distinct motions can be controlled in the type writer. As a matter of fact less than fifty are required to operate that useful machine. If it be understood that the operator with his keyboard sits in New York, and the selecting machine and type writer are in Washington, the full scope of the invention as applied to telegraphy will be made evident.

The following is a diagram of this machine:



APPLIED TO THE TYPE WRITER.

With ten properly perforated plates operated by ten keys a total number of 1,023 changes, Mr. Munson claims, can be made by using the ten keys in every possible combination. Limiting the combinations to one key or two and three keys at a time he makes eighty-four changes. The ten plates are held suspended on a level. On pressing a key the corresponding plate is depressed, bringing an aperture before the thrust pin, which goes through the ten plates. By pressing any two keys the two corresponding plates are depressed with the same result. By pressing down any three keys the same result is obtained—a single hole left open for a single pin. The model machine which Mr. Munson has had constructed does not perform all that has been previously laid down as demonstrably possible. It illustrates the principle, however, to a nicety. The ten keys, with their combinations, which he uses, will in a later machine give way to a keyboard, each key bearing a letter of the alphabet, numeral, punctuation mark or other sign. These keys will themselves, when depressed, make the combinations needed to operate the slides. He may, he says, even provide a mechanism by which any of the twenty-five words oftenest used in the English language can be produced by depressing a single key. He proposes, in his next machine, to

use eleven plates or slides instead of ten, which will give him the command of 165 holes, made by depressions of no more than three plates at a time. It is hardly necessary to state the manner in which the impulses given by the keys are communicated electrically to the perforated slides, nor to show the method by which the electric current can be made to operate so simple a matter as the lever of a type-writer. These details are among the common-places of the electrician of to-day. The operating keyboard may and probably will, be made a part of the type-writing machine, so that the message sent from New York to Washington will be printed in both places at the same instant.

APPLIED TO THE TYPE-SETTER.

A further possible application of the invention is more curious still, and may in time prove of some account as saving of labor and time. It is to apply the invention to the best type-setting machine known. By its means an operator in Washington could actually "set up" the type in New York, although, of course, the task of "justifying" would remain. At present an operator sends a dispatch, another operator receives it, a messenger takes it to the newspaper, an editor puts it into proper form for print, a messenger takes it to the composing room, where a printer puts it in type. By Mr. Munson's plan a single operator would put it in type and a youth would "justify" it. It may, however, be suggested that the difficulty of correcting errors made by the operator would be very great, and that to "pi" a line would be disastrous, since there would be nothing in the printing office by which to detect the one or supply the other. Operators would, like printers, be human, and, therefore, as we know, liable to error. Mr. Munson is a native of New York State, a phonographer by profession, and has been, in that capacity, attached to one of our courts for a number of years. He has patented his invention in the United States, England, France, Germany and Belgium.

TELEGRAPH WIRES IN CITIES.

From the New York World.

Senator Daly's committee on the telegraph question is an able and intelligent committee, and the community should be thankful that it is. For how to brush away the gigantic cobweb of telegraph wires now spun from pole and housetop along the streets of large cities is a vexed and vexing question constantly forced into consideration by new adaptations of electricity to public needs and the extraordinary growth of the telephone, electric light and district systems.

The wires of the ordinary telegraph service, as being of relatively small extent and number, and confined mainly to a few trunk lines of generally continuous character, do not constitute an element of much consequence in the problem. New York could bear with these in the future, as New York has borne with them in the past, without serious annoyance; but how are we to deal with the multiplicity of circuits required to reach the individual premises of each subscriber to the telephone, news and stock reporting and district messenger systems, not to mention the fire-alarm and other municipal wires, and the electric-light conductors on top of all? Here is a tangle of very considerable complexity and consequence, alike from the standpoint of the property-owner whose house is netted over with vagrant lightning wires, and of the casual passenger in the streets who longs to see the blue sky once more not as through a gridiron.

Nor is the question simplified when we consider that as the service rendered in commercial and fam-

ily life by the existing telephone and district messenger systems has become a necessity of our civilization, a law thrusting all wires underground might virtually result, in the present state of the art of subterranean insulation, in the prohibition of their business and in the confiscation of their present elaborate and costly plant.

It is a not uncommon but an incorrect impression that in the larger foreign cities, and notably in London and Paris, these difficulties have been solved by a sufficient underground system, and that the methods of London and Paris would answer for New York. Telegraphic facilities, as we understand them, are not used in one case in Europe where they are used in fifty in the United States. London and Paris have no district messenger or stock or news reporting systems at all, and telephone exchanges are a novelty all over Europe. If we take London and Paris as the most prominent types for comparison with New York, many obvious points of difference suggest themselves to show that we cannot adopt their methods with advantage.

In Paris, a city nearly circular in its general configuration, and provided with a system of sewers which are in effect underground galleries, the telegraph lines come into the heart of the city on pole lines along the various railroads, and are then conveniently connected with the central office through cables in the sewers, thus easily reaching the principal telegraph centre in the Rue de Grenelle. There the business is gathered and distributed by means of short lines of pneumatic tubes radiating to convenient points, but no underground telegraph system of any sort exists beyond a few isolated short lines of the kind necessarily required to meet the situation in New York.

In London also the various railways, with their viaducts running into the heart of the city and connecting by loop lines with each other, offer convenient support for telegraph wires, and these, after leaving the railway stations, need only brief stretches of underground wires to reach the central station in the City proper at St. Martin's le Grand. The latter station does not connect with its principal branch offices by underground wires, but uses pneumatic tubes, as does also the office in the Strand opposite Charing Cross, which handles the business of perhaps the largest telegraph centre in the world, while possessing, strictly speaking, no telegraphic wires or apparatus of any kind.

New York, on the other hand, with its long narrow configuration, has no railroads centering in the business portion of the city and no business centres which are available for convenient connections by short and practicable systems of pneumatic tubes. Thus we are shut up to the maintenance of our present long stretches of pole trunk lines for the telegraphs, irrespectively of the demands of the telephone, stock-reporting and district system.

But leaving London and Paris out of consideration, and looking at other cities of Europe, it is found that these are able to relieve themselves of telegraph wires in the streets only by a sacrifice of the telegraphic facilities of the public. Bruges and Ghent, both large manufacturing towns in Belgium, have but one telegraph office each, and these in each case are in the railroad stations, connected with pole lines. Brussels, the capital of Belgium, and Antwerp, a very important seaport, maintain each but one office in the city away from the railway stations, while Geneva, Berne and Zurich, in Switzerland, confine their telegraph offices to the railway stations. These are types, and their case is identical with that of all cities in Europe which have not railways to carry the telegraph lines into the centres of population. And it should be borne

in mind that not one of these towns is burdened with district or stock-reporting systems or uses the telephone except to a limited extent. It is apparent that cities in this State of a similar class, like Rochester, Albany and Buffalo, for example, would not remain satisfied with telegraphic service of this meagre nature.

As to the feature of house-top lines, that has already followed the introduction of telephones in London, Paris and other European cities, and the grievance is already finding its place with them as a subject of public clamor. House-top lines, indeed, seem to be a necessary and inevitable consequence of any successful introduction of the telephone exchange system.

Taking, then, a comprehensive view of the whole field, it may be safely asserted, certainly as far as New York is concerned, that it is not practicable, in the present state of the art and business of telegraphy, to do away with overhead wires or to place the system underground. That the time will come when it may be both safe and practicable to adopt a general underground system for telegraph lines, if not for telephone and district wires, is probable, since the many electric and mechanical difficulties which attend the insulation of underground electric conductors are gradually and steadily being met with and overcome; and that the telegraph companies will be prompt to take advantage of any such possibility is manifest in view of the relief to be secured against the manifold risks from alecstorms, falling poles or wires and other interferences attendant upon the present overhead lines.

Telegraph wires and fixtures in the streets and on house-tops are, of course, both unsightly and inconvenient, and should be removed whenever practicable. But New York depends on them now for her ample telegraphic facilities, not otherwise attainable, and the balance of inconvenience clearly lies in the direction of any interference with a service of such importance as that which is rendered by the telegraph, the telephone, the stock-reporting and the district systems in our complex and progressive life.

ATMOSPHERIC ELECTRICITY.

At a recent meeting of the California Academy of Sciences, Mr. C. D. Gibbs, O.E., remarked that when surveying during the north winds, which are prevalent at certain times of the year, in the San Joaquin valley, the electrical disturbance was so great as to cause the needle of his compass to fly up against the glass and become useless during the first part of the day when in the field; but that if he took the same compass into a warm moist room it again acted normally. Engineers in Santa Clara and Calaveras counties report the same action and dip of the magnetic needle during the prevalence of the dry north winds. Dr. Harkness said these winds affected the human skin. Dry atmosphere was a perfect non-conductor, but all moist plants and animals, as well as men, then became so many miniature lightning-rods. The nerves were at such times continually irritated by a constant succession of tiny blows, like telegraphic ticks, against the nerve centres. They contracted and produced a congestion of the organs; the blood became turbid, while kidneys, liver, and lungs all suffered.

THE GERMAN CABLE.

On the 24th inst. the new cable between Valentia and Germany will be open for traffic. On and after that date the extra continental rate will be discontinued and the tariff to Germany will be the same as to the United Kingdom and France.

PUBLISHED MONTHLY, ON 20TH OF EACH MONTH, AT
125 BROADWAY.

Invariably in advance.

ADVERTISING RATES

* Cuts charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, APRIL 20, 1862.

TO MANAGERS' OF OFFICES.

Copies of the JOURNAL in good condition are wanted of March 1st 1882, No. 344. Please address them to Editor JOURNAL OF THE TELEGRAPH, New York City.

BAD PENMANSHIP.

and brevity each time. The number of times can be proved somewhat easier than Dr. Johnson proved that a cat had three tails. His plan was in asserting that no cat had two tails and a cat had one tail more than no cat, hence a cat has threetails. Now, a telegraph message has to go through five ordeals. The *first* is that in the mind of the sender which he hurriedly scrawls in the fewest words possible, and it may or may not express what he desires to convey. The *second* is the receiving operator, who takes this and is not guided by the sense of the words and cannot add to or detract from them ; he makes them out the best he can in a hurry and transmits them to another operator, who, in the *third* place, is guided by what he takes to be expressions of the sender ; he reads it and then hurriedly scratches it off, partly from memory, it may be, and this the *fourth* movement is delivered to the receiver, who is the *fifth* party who must decipher this and understand it if he can. The telegraph company must see that at least three of these are properly well done. The operator must accurately read the message received and send it in such manner as to enable the receiving operator to write it down in such a manner as to make it readable to the receiver. The great burden, after all, is upon the two operators, and good penmanship on the part of the sender of the message and also on the part of the receiver of the message would wonderfully lessen the troubles and burdens and hazards of many business communications.

The question of what is good penmanship is one that, strange to say, is not capable of being definitely answered to the satisfaction of everybody, and we might say anybody. The definition, based upon the business experience of modern times, is not that ornamental species of graceful and shaded curves which writing teachers would have us believe and feign teach our sons in schools and business colleges. Neither is it that "round hand" and "hair lines," which was the aim and delight of our fathers half a century ago and is still the delight of our English cousins. That is all very well for engrossing and for records and social correspondence, but young men, it is not what you will need for use in active business life!

What is needed and where can I learn it, you ask. What is needed is to make the letters in writing of the shortest length practicable and without curves where it is possible to retain the contour of letters without it, hold the pen as close to the paper as possible, and make as little motion as possible, and never try to shade letters or to make graceful and ornamental curves. Write all capital letters very plain and all numerical figures distinctly, and write all proper names and abbreviations distinctly and carefully. This is because there is generally no means of ascertaining them by the sense. You are insured of rapidity and it may be said general gracefulness when you make letters in the shortest and easiest way possible, as above suggested; this, with the proper names and figures distinct, will render such writing easily read. The usual indistinct

strictness of numerical figures in writing has led telegraph companies to require all numbers to be spelled out both in receiving and sending messages, to avoid frequent errors in them. Punctuation is also important as well as the use of capital letters, to aid in ascertaining the sense of words. Ornamental penmanship is as much out of place in a telegraph message as it would be to waltz to your place of business instead of directly stepping there. Business penmanship is not as much taught in schools and colleges as it ought to be, and hence a person must be his own teacher in a great measure and learn by experience and observation the manner and style which is the easiest and best for himself to insure the most rapid and readable hand, and not be guided by mere imitation, as is characteristically the case in ornamental manmanship. Nearly all telegraph operators are required to be able to write from twenty to thirty words a minute, and a few have even been able to write fifty short words a minute so it could be read without being copied over by the receiving operator. In large business centres the copying over of a telegraph message is not expected or generally allowed.

While we are firm believers that handwriting shows the characteristics of the writer, particularly in autographs, it is not so marked in business communications, as it is left more to the habit and practice of the writer, and is circumscribed much by time and the opportunity afforded for display of taste, which do not attend the mere signing of one's name, according to his own fancy. Persons who do not write much show their individual character more when they do write than those who write much and in haste.

Our closing advice is, let your letters be made plain, well defined and brief, without curves and flourishes, and it will be a blessing and not a curse to all who have to do anything with it.

HISTORY OF UNITED STATES MILITARY TELEGRAPHS COMPLETED.

It will be remembered that Mr. W. R. Plum, one of the most active telegraph officers serving in the late war under Major-General G. H. Thomas, and now attorney in Chicago, has during some years been engaged in writing a History of Military Telegraphs employed during the above-mentioned war. Unfortunately Mr. Plum has been prevented by overwork and consequent illness from publishing his book at an earlier date. We are happy to congratulate the author, not only on the restoration of his health, but also on the completion of the work. The history consists of two volumes; the first is already printed, and the second will be shortly issued. We anticipate that this work will not only be of great value as an historical contribution to military literature, but will considerably assist the solving of the all important question in military telegraphy, as to whether field telegraphs should only be used for strategical purposes at the rear of head-quarters, or for the more important service of tactical operations in the front of the enemy.

The Federal army set the example before any other had thought of utilizing the field telegraph in front of the enemy. We think that the statements and reports from such a distinguished officer will

prove exceedingly useful to the field telegraph departments of all armies. It is gratifying to see that this branch of English literature, which has been up to the present so poorly represented, will now be enriched by such a valuable work. We hope to give a more extended notice of this work.

BUSINESS NOTICES.

New York, April 20, 1882.

IMPORTANT NOTICE—To Superintendents, Managers, Purchasing Agents and others having on hand worn out, damaged or useless Morse keys, we will from date until May 31st furnish our New Steel Lever Keys in exchange for all old keys for a cash difference of \$1.66 each. This price applies to any number of keys, no matter in what condition the old ones may be. They must be delivered to us, in packages plainly marked "Keys," with all charges prepaid and remittance should accompany the orders, except from Superintendents and Purchasing Agents of well known companies.

Now is the time, while this offer holds good, to get together all of your used up and "bad" keys and exchange them for splendid new ones. See description and advertisement of Steel Lever Key in this paper.

J. H. BUNNELL & Co.,
112 Liberty St., N.Y.

If you want to become a telegraph operator, send twenty five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

BOOK NOTICE.

An outline of Commercial and Railway Telegraphy in Theory and Practice, arranged in questions and answers. Compiled and prepared by J. P. Abernethy, Superintendent Telegraph. pp. 112. Cleveland, Ohio; 1882.

This book is one of great practical value to any telegraph operator. It is evident to an experienced operator that much valuable information has been carefully selected from a large amount of material gathered together from official sources, as well as from the experience of efficient operators in all grades of service. And that portion regarding Railway Telegraphy has been derived from official as well as from other reliable sources in connection with the most prominent railways in this country. Although brief, the work has evidently been carefully prepared and made as complete, comprehensive and practical as possible. It is deserving of a wide use among operators.

THE FIRST ELECTRIC ARC LIGHT.

PROFESSOR SYLVANUS THOMPSON's third lecture on "Electric Arc Lights" was delivered on Wednesday night at the Crystal Palace, in the large concert room. The electric arc was discovered about the year 1804, by Sir Humphrey Davy, when experimenting upon the different kinds of sparks produced between wires of various materials attached to the terminals of a large voltaic battery. Sir Humphrey found that when pieces of charcoal were tied to the battery wires, were then brought for a moment into contact, and then withdrawn apart to a short distance, a kind of flame played across from one charcoal point to the other, whilst the charcoal points themselves glowed with a most intolerable brilliancy. The difficulty of applying and using this voltaic arc or flame arose from its excessive sensitiveness, which made it flicker when there was the smallest irregularity either in the flow of the electric current that fed it or in the quality of the carbon. Pencils of

hard artificially-prepared coke carbon were now universally used instead of wood charcoal. To control the light the carbon pencils were held by an instrument called a regulator or electric lamp. The regulator had to perform the office of feeding the carbon pencils into the arc as fast as they burned away, the rate of feeding being controlled electrically by the strength of the current that passed through the lamp. This operation of feeding was in some cases performed by a clockwork train operated by springs, or by the weight of the descending rod of carbon. Another requirement, which the regulator must satisfy was that in case of extinction of the arc it should relight it by bringing the carbon points together and then separating them to the necessary distance.

REWARDS FOR DISTINGUISHED MERIT.

THE Albert Medal of the Society of Arts to reward "distinguished merit in promoting arts, manufactures and commerce," was struck and issued for the first time in 1864, Sir Rowland Hill, K.O.B., being the recipient. From that date inclusive there have been eighteen awards of this honor, one-third of them falling to the share of eminent electricians in the following rotation:—In 1866, to Professor Faraday, D.O.L., F.R.S., for "discoveries in electricity, magnetism and chemistry, which, in their relation to the industries of the world, have so largely promoted arts, manufactures and commerce." In 1867 to Mr. (afterwards Sir) W. Fothergill Cooke and Professor (afterwards Sir) Charles Wheatstone, F.R.S., "in recognition of their joint labors in establishing the first electric telegraph." In 1873, to C. W. Siemens, D.O.L., F.R.S., "for his researches in connection with the laws of heat, and the practical applications of them to furnaces used in the arts; and for his improvement in the manufacture of iron; and generally for the services rendered by him in connection with economization of fuel in its various applications to the manufactures and the arts." In 1876, to Sir George B. Airy, K.O.B., F.R.S., astronomer royal, "for eminent services rendered to commerce by his researches in nautical astronomy and in magnetism, and by his improvements in the application of the mariners' compass to the navigation of iron ships." In 1879, to Sir William Thomson, L.L.D., D.O.L., F.R.S., "on account of the signal services rendered to arts, manufactures and commerce by his electrical researches, especially with reference to the transmission of telegraphic messages over ocean cables." In 1880, to James Prescott Joule, LL.D., D.C.L., "for having established, after most laborious research, the true relation between heat, electricity, and mechanical work, thus affording to the engineer a sure guide in the application of science and industrial pursuits."—*Society of Arts' Journal*.

THE WHEATSTONE AUTOMATIC TELEGRAPH IN ENGLAND.

In a lecture recently delivered before the Society of Arts in London, by Prof. Preece, he said: "The system of telegraphy I have just shown is the ordinary one-way method; but it is possible to send two messages in the opposite direction at the same time upon one wire, and this I can make clear without going into a detailed explanation, by asking Liverpool to send dashes or long sounds to me while I send dots or rapid sounds to him. We go still further and send four messages in opposite directions, at the same time upon one wire, that is called quadruplex telegraphy. But the same of telegraphy has been produced in this country by the Wheatstone automatic apparatus. I have a complete set of this apparatus before me. In it the messages are

prepared by being punched with little holes (as you now see being done), and I now hold a strip of paper bearing perforations representing the alphabet, which look very much like the patterns used in the Jacquard loom for lace making. The perforated paper is put in the transmitter, which sends currents of electricity, representing the holes upon it; these currents of electricity are received by a "receiver," by which they are made to represent dots and dashes recorded on a long slip of Green paper, and these dots and dashes indicate to the clerk at the receiving station the message sent. The peculiarity of this instrument is its rapidity, for, by it, instead of being only able to send from 20 to 40 words a minute (the limit of the human hand), from 250 to 300 words a minute can be transmitted. At the present moment there is not a town in this country where a daily paper is published that is not in direct communication with London, and receives its intelligence by means of apparatus of this description. Whatever news it is, whether on account of the Canonbury railway accident, or a panic that may have happened this afternoon in some theatre, or something else now going forward to the country papers, it is being sent by means of this perforated paper and automatic instrument. But it is impossible for me to describe it minutely now, because it would occupy more than one lecture to understand the whole working of the system. It is most extensively employed in this country, where the growth of telegraph business has been enormous. I spoke in rather glowing terms of the duties and doings of this automatic apparatus when in Paris, and my Parisian friends rather doubted my statement. However, I induced the French Government to send an officer over to England to examine for themselves the working of this instrument; and to my great pleasure when he came here he found that my statements were under the mark; and only a few days ago, when an experiment was tried, to satisfy the French gentlemen, we were able to transmit on a wire between London and Glasgow no less than 359 words a minute.

A NEW MAGNETO-ELECTRIC EXPLODER.

M. MARCEL DEPREZ, the eminent French electrician, has constructed a new magneto-electric machine for exploding mines and torpedoes, which possesses several points of interest. Instead of passing the instantaneous current induced in the coiled armature suddenly snatched from the poles of a magnet, directly through the wires to the mine, he passes it through the primary circuit of an induction coil, and the secondary spark from this coil is sent along the wires to explode the mine. This change, says *Engineering*, necessitates some modification in the exploder as ordinarily made. For instance, the wire of the armature coil ought to be thick, so as to give small resistance, and the induced current due to the withdrawal of the armature should be broken when at its maximum strength, in order that the rupture may induce a maximum current in the secondary circuit of the induction coil. M. Deprez also found that ordinarily the armatures of exploders contained too much iron, and he has therefore reduced this feature. In the new exploder of M. Deprez, the armature consists of a coil of stout wire wound on a core of sheet-iron, which is carried by two crank-levers mounted on the same axle. By striking a small pedal attached to the other arms of these levers, the armature is suddenly jerked away from the poles of the homeshoe permanent magnet it rests against, and the spark generated flows into the primary of the induction coil. The interrupter of the latter is to be adjusted so as to give the longest spark from the secondary.

UNITED STATES PATENT OFFICE.

We extract from the Annual Report of the Commissioner of Patents for the year ending December, 1881, the following interesting particulars:—

SUMMARY OF THE BUSINESS OF THE OFFICE.

| | |
|---|--------|
| Number of applications for patents for inventions.... | 24,878 |
| Number of applications for patents for designs..... | 678 |
| Number of applications for reissues of patents..... | 508 |
| Total number of applications relating to patents.... | 26,059 |
| Number of caveats filed..... | 2,406 |
| Number of applications for registration of trade-marks..... | 611 |
| Number of applications for registration of labels..... | 368 |
| Number of disclaimers filed..... | 14 |
| Number of appeals on the merits..... | 789 |
| Total..... | 4,183 |

| | |
|--|--------|
| Total number of applications requiring investigation and action..... | 30,242 |
| Number of patents issued, including designs..... | 16,113 |
| Number of patents reissued..... | 471 |
| Number of trade-marks registered..... | 834 |
| Number of labels registered..... | 202 |

| | |
|---|--------|
| Total number of patents granted and certificates issued..... | 17,620 |
| Number of patents expired during the year..... | 4,838 |
| Number of patents withheld for non-payment of final fee..... | 1,511 |
| Patents issued to citizens of the United States..... | 15,118 |
| Patents issued to citizens of foreign countries, 995, England claiming the greatest number. | |

COMPARATIVE STATEMENT OF THE BUSINESS OF THE OFFICE FROM 1887 TO 1881 INCLUSIVE.

| Year. | Appli- cations. | Caveats filed. | Patents and re- issues. | Cash re- ceived. | Cash ex- pended. | Surplus. |
|-------|--------------------|-------------------|-------------------------------|---------------------|---------------------|------------|
| 1887 | .... | .... | 435 | \$29,289.08 | \$33,506.98 | .... |
| 1888 | .... | .... | 520 | 42,123.54 | 37,402.10 | \$4,721.44 |
| 1889 | .... | .... | 425 | 37,210.00 | 34,543.51 | 2,716.49 |
| 1890 | 735 | 228 | 473 | 38,056.51 | 39,020.67 | .... |
| 1891 | 847 | 312 | 496 | 40,413.01 | 52,666.87 | .... |
| 1892 | 761 | 391 | 517 | 36,505.68 | 31,241.48 | 5,264.20 |
| 1893 | 819 | 315 | 510 | 35,315.81 | 30,776.96 | 4,538.85 |
| 1894 | 1,045 | 380 | 493 | 42,609.26 | 36,244.73 | 6,264.53 |
| 1895 | 1,246 | 452 | 504 | 51,876.14 | 39,395.65 | 11,680.49 |
| 1896 | 1,372 | 448 | 638 | 50,264.16 | 40,158.71 | 10,105.45 |
| 1897 | 1,581 | 553 | 569 | 63,111.19 | 41,878.36 | 21,232.84 |
| 1898 | 1,639 | 607 | 652 | 67,576.69 | 58,905.84 | 8,670.85 |
| 1899 | 1,955 | 595 | 1,051 | 89,759.98 | 77,716.44 | 12,043.54 |
| 1890 | 2,193 | 602 | 993 | 86,927.05 | 80,100.95 | 6,826.10 |
| 1891 | 2,258 | 760 | 672 | 95,338.61 | 86,916.93 | 8,421.68 |
| 1892 | 2,619 | 998 | 1,019 | 112,856.34 | 95,916.91 | 16,939.43 |
| 1893 | 2,673 | 901 | 961 | 121,627.45 | 132,869.83 | .... |
| 1894 | 3,328 | 863 | 1,844 | 163,789.84 | 167,146.32 | .... |
| 1895 | 4,435 | 906 | 2,012 | 216,459.35 | 179,640.33 | 36,819.02 |
| 1896 | 4,900 | 1,024 | 2,505 | 192,585.02 | 199,931.02 | .... |
| 1897 | 4,771 | 1,010 | 2,896 | 196,132.01 | 211,682.09 | .... |
| 1898 | 5,364 | 934 | 3,695 | 203,716.16 | 193,193.74 | 10,522.42 |
| 1899 | 6,225 | 1,037 | 4,504 | 245,942.15 | 210,278.41 | 35,663.74 |
| 1890 | 7,653 | 1,054 | 4,778 | 266,352.69 | 252,820.80 | 13,531.89 |
| 1891 | 8,443 | 700 | 5,329 | 337,354.44 | 221,491.91 | .... |
| 1892 | 9,038 | 824 | 5,632 | 315,754.99 | 182,810.39 | 132,944.60 |
| 1893 | 9,014 | 787 | 4,184 | 195,593.29 | 189,414.14 | 6,179.15 |
| 1894 | 9,932 | 1,063 | 5,025 | 240,919.98 | 229,868.00 | 11,051.98 |
| 1895 | 10,664 | 1,937 | 6,616 | 348,791.84 | 274,199.34 | 74,592.50 |
| 1896 | 15,269 | 2,723 | 9,458 | 496,066.38 | 361,724.28 | 133,941.10 |
| 1897 | 21,276 | 3,597 | 13,026 | 646,681.92 | 339,263.32 | 307,418.60 |
| 1898 | 20,420 | 3,705 | 13,410 | 681,565.86 | 628,679.77 | 52,886.09 |
| 1899 | 19,271 | 3,624 | 13,907 | 693,145.81 | 486,430.78 | 206,715.03 |
| 1890 | 19,171 | 3,273 | 13,333 | 689,456.76 | 557,149.19 | 132,307.57 |
| 1891 | 19,472 | 3,366 | 13,056 | 678,716.46 | 560,595.08 | 118,121.38 |
| 1892 | 18,246 | 3,090 | 13,613 | 699,726.39 | 665,591.36 | 34,135.03 |
| 1893 | 20,414 | 3,243 | 12,864 | 703,191.77 | 691,178.98 | 12,012.79 |
| 1894 | 21,602 | 3,181 | 13,599 | 738,278.17 | 679,288.41 | 58,989.76 |
| 1895 | 21,638 | 3,094 | 14,837 | 743,453.36 | 721,657.71 | 21,795.65 |
| 1896 | 21,425 | 2,697 | 15,595 | 751,987.85 | 652,542.60 | 105,445.25 |
| 1897 | 20,368 | 2,809 | 14,187 | 732,842.85 | 612,152.62 | 120,690.23 |
| 1898 | 20,260 | 2,755 | 13,444 | 725,375.55 | 591,042.89 | 132,332.66 |
| 1899 | 20,069 | 2,620 | 13,213 | 703,931.47 | 529,638.97 | 174,292.50 |
| 1890 | 20,012 | 2,490 | 13,947 | 749,685.32 | 633,865.17 | 115,820.15 |
| 1891 | 26,059 | 2,406 | 16,584 | 853,665.89 | 696,178.28 | 157,487.61 |

The receipts of the Office during the past year exceed those of any previous year by nearly 100,000 dollars.

The telephone is utilized in Southern Colorado and New Mexico to unite widely separated ranches.

An English photographer at Hexam succeeded last July in taking a flash of lightning. The plates were backed with red paper.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, April 20, 1882.

To all offices on Western Union lines:

The following changes which have been made since March 20, 1882, should be entered in the Tariff Book as they will not be republished.

CHANGES.

ARIZONA.

* Florence, 25 1 Maricopa, or 50 4 (30 2 N. M. rate) Casa Grande.

CALIFORNIA.

720 Banning, closed.
806 Callahans, reopened.
756 Gaviota, closed.
781 Midway, closed.
808 Moscow, closed.
827 Point Arenas, closed.

COLORADO.

* Barnum's, reopened.
558 Blackburn, closed.
* Irwin, now 25 2 Gunnison.
* Ruby, now 25 2 Gunnison.

CONNECTICUT.

* Turnerville, now a W. Union office, square 29.

DAKOTA.

* Mlandreau, 55 4 La Crosse, Wis., 50 3 Ramsey, Minn., or 25 2 Sioux Falls, Dak.
904 Gayville, reopened.

FLORIDA.

* Fort Reid, now 100 0 Sanford.

GEORGIA.

176 Doctortown, closed.
257 Hogansville, closed.
267 Palmetto, closed.

IDAHO.

580 Market Lake, reopened.

ILLINOIS.

348 Alton Junction, changed to 248 Wann.
326 Tucker Siding, closed.

INDIANA.

* New Harmony is now a W. Union office, square 300.

IOWA.

406 Benson Grove, closed.

KANSAS.

457 Arcadia, reopened.
507 Ogden, now 507 Ogdensburg.

KENTUCKY.

339 Fort Jefferson, closed.

LOUISIANA.

* Donaldsonville, 50 3 (30 2 N. M. rate) New Orleans.
* Lake Providence, closed.

MARYLAND.

103 Clear Spring, reopened.

MICHIGAN.

49 Eagle Mills, closed.

* So. Saginaw, now 25 0 East Saginaw.

MINNESOTA.

* C. D. & M. Junc., closed.

854 Thomson, closed.

* Messages to "other" line offices on the Southern Minnesota R. R. line in Minn. may be sent via and checked to Sioux Falls, Dak., if the latter offers a cheaper or more direct rate. The "other" line rates from Sioux Falls are as follows: Alden, Armstrong, and Brownsdale, 50 3, Delavan, 45 3, Dexter 50 3, Easton, 45 3, Edgerton, 30 2, Fairmont, 45 3, Fountain, 50 3, Fulda, 35 2, Grand Meadow and Hayward, 50 3, Hokah and Houston, 55 4, Huntley, 45 3, Isinours, 50 3, Jackson and Lakefield, 40 3, Lanesboro and Oakland, 50 3, Peterson, 55 4, Pipestone, 30 2, Rushford, 55 4, Sherburn, 40 3, Spring Valley, Whalan and Wykoff, 50 3. Offices in the Eastern, Middle and Southern States will not be able to use the route via Sioux Falls, and therefore, need not enter the "other" line rates via that route.

MISSISSIPPI.

381 Michigan City is now 381 Michigan City.

MISSOURI.

438 Carbon Center, closed.

NEVADA.

* Candelaria, now Western Union office Square 677.

NEW JERSEY.

47 Kingston, reopened. Ok. Trenton.

NEW MEXICO.

* Mesilla, now 25 1 El Paso, Tex. Erase "25 1 Maricopa Wells, Ariz."

NEW YORK.

* Castor Land, now 25 2 Utica.
** Freetown, Courtland Co., now 100 0 delivery from Blodgett's Mills. Erase "15 0 by telephone Blodgett's Mills."
* Glasco, now *Glasco, 10 1 Saugerties.
* Glendale, 25 2 Utica.
* Lyons Falls, now 25 2 Utica.
45 Stillwater, closed.

OHIO.

170 Belmont, closed.
** Deerfield, Portage Co., is now W. Union office, square 159.
221 Mill Grove, P. O. Hatton.
** Newton Falls is now W. Union office square 159.
** Palmyra is now W. Union office, square 159.

PENNSYLVANIA.

151 Birmingham, Allegheny Co., changed to 151 South Side, Pittsburgh. Tariff same as Pittsburgh, ck. Pittsburgh.
* East Greenville is now W. Union office, square 59. Ch. Pennsylvania.
151 Finleyville, closed.
111 Kansas Branch, closed.
111 North Branch.
131 Scottsdale, now** Scottsdale 10 0 Everson.
159 Walker's Mills, now 151 Walker's Mills.

TENNESSEE.

265 McMinnville, closed.

TEXAS.

485 Arcola, closed.
* Banquete, 25 2 Corpus Christi or 50 3 Laredo.
* Castroville, closed.
654 Carson, closed.
* Collins, 30 2 Corpus Christi or 50 3 Laredo.
654 Douro, closed.
470 Hughes Springs, closed.
* Mason, closed.
480 Oakwoods, changed to 480 Tucker.

UTAH.

* Alta City, reopened.

VERMONT.

38 Georgia P. O. is East Georgia.

WISCONSIN.

555 Pineville, closed.

ATLANTIC CABLE.

CHANGE IN RATE TO GERMANY.

On and after Monday, April 24, the rate per word to Germany will be the same as to England or to France. The present rate of nine cents per word beyond London will be discontinued on the above named date.

Cable business should be entered on regular Monthly Account Current under the head of "Sundry Receipts." It should not be entered on Check Report. A distinct record should be kept, and at the end of each month a report upon blank No. 67, in accordance with the instructions printed thereon, should be promptly forwarded to the district superintendent.

The foregoing cancels the second paragraph under rules page 339 Tariff book.

Page 340. New Tariff Book, Rule 3, add the following: Rio Grande, meaning Rio Grande do Sul, is counted as one word. Desterro, meaning Santa Catarina, is counted as one word.

Page 345. Erase "38" opposite Mauritius. The Aden rate plus postage should be used.

Page 346. Tariff to the Scilly Islands is same as to London. Erase the 12c. rate.

Page 346. "Rio de Janeiro and places north," &c. The \$2 44 should read \$2.41.

Page 347. Tunisia should read 2c. instead of 12c.

We are notified that messages can now be accepted for Yemen, in Arabia, to be forwarded by express from Aden. The words "Express Aden" must be inserted and paid for.

Charge the Aden rate on this business. The express charges beyond Aden will be collected from the addressee.

The Mozambique to Zanzibar and the Bahia to Rio de Janeiro cables are interrupted. Messages will be forwarded during interruption by best means. No alteration in rates.

CUBA CABLE.

The cable between Trinidad and Demerara has been repaired.

In cipher messages to Cuba, and places beyond, groups of figures or letters or figures and letters should be counted at the rate of five figures or letters to a word, thus: the group 12345 should be counted as one word; 123456 as two words; 123 as one word; 1ab2 as one word; abcdef as two words. To the number of words thus obtained add the ordinary words of the message and charge for the whole a rate and a half, or one-half in addition to the ordinary rates.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed; first the names of Western Union Offices in three columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

| | | |
|---|-----------------|------------------|
| 313 Akron. | 323 E. pos. | 267 Notasulga. |
| 285 Bangor. | 293 Falkville. | 276 Wilsonville. |
| 294 Calera. | 324 Prichards. | |
| 323 Cuba. | 268 Stock Mill. | |
| * Alexander City, 40 3 (25 1 N. M. rate) Opelika. | | |
| * Dadeville 40 3 (25 1 N. M. rate) Opelika. | | |
| * Ft. Morgan, 75 6 Mobile. | | |
| * Gainesville, 25 2 Epos. | | |
| * Point Clear, 50 3 Mobile. | | |

ARIZONA.

| | | |
|---|----------------|--------------|
| 638 Bowie Station. | 644 Gila Bend. | 659 Winslow. |
| 640 Canon Diablo. | 658 Mohrbrook. | |
| 641 Contention. | 645 Sentinel. | |
| * Pinal, 50 4 (30 2 N. M. rate) Casa Grande. | | |
| * Silver King 50 4 (30 2 N. M. rate) Casa Grande. | | |

ARKANSAS.

| | | |
|----------------|------------------|----------------|
| 449 Brentwood. | 391 Jacksonport. | 449 West Fork. |
| 571 Knobel. | 401 Russell. | 449 Winslow. |

CALIFORNIA.

| | | |
|--|---------------------|----------------------|
| 800 Alameda Point. | 799 Norman Station. | 718 Volcano Springs. |
| 827 Albion Mills. | 800 Ocean View. | 827 Whitesboro. |
| 806 Decoto. | 720 San Geronimo. | |
| | 826 Table Bluff. | |
| * Bidwell's Bridge, 25 2 by telephone, Greenville. | | |
| * Fall Brook, 40 3 San Diego. | | |
| * Lafayette, 15 2 by telephone, Martinez. | | |
| * National City, 25 2 San Diego. | | |
| * Walnut Creek, 15 2 by telephone, Martinez. | | |

COLORADO.

| | | |
|-----------------------|------------------|-------------------|
| 646 Agate. | 645 Hardin. | 550 Pinon. |
| 646 Bennett. | 590 Holleys. | 557 Red Cliff. |
| 646 Boreas. | 599 Horton. | 634 Rockwood. |
| 623 Browns Canon. | 623 Hot springs. | 628 Sargents. |
| 640 Buffalo, Weld Co. | 634 Ignacio. | 586 Sedgwick. |
| 623 Calumet. | 640 Liff. | 548 Snyder. |
| 652 Carr. | La Salle. | 558 South Pueblo. |
| 640 Crook. | 558 Oak Creek. | Ok. Pueblo. |
| 645 Deane. | 548 Orchard. | 599 Tennessee. |
| 659 Earle. | 557 Pine Grove. | 592 Timpa. |

(41 First View.

- * Akron, (N. M.) 55 4 Plattsmouth.
- * Al's 25 1 Gunnison.
- * Conejos, 25 0 Antonito.
- * Kokley (N. M.) 50 4 Plattsmouth, Neb.
- * Rock springs (N. M.) 65 4 Plattsmouth, Neb.

CONNECTICUT.

| | | |
|--|----------------|-------------|
| 25 Hop River. | 29 South Lyme. | 37 Stepney. |
| * Bridgewater, 20 0 by telephone, New Milford. | | |
| * Naubuc, 30 8 Hartford. | | |
| * Noroton, 10 0 by telephone, Stamford. | | |
| * Warren, 30 0 by telephone, New Milford. | | |
| ** Whitneyville, 50 0 New Haven. | | |
| * Winnipauk, 10 0 by telephone, Norwalk. | | |

DAKOTA.

| | | |
|---|----------------|------------------|
| 826 Big Stone City. | 890 Hillsboro. | 920 Northville. |
| 940 Canning. | 926 Hitchcock. | 915 Ordway. |
| 915 Chamberlain. | 947 Houston. | 908 Preston. |
| 947 Dickinson. | 936 Kindred. | 924 Steele sta. |
| 938 Eagles Nest. | 936 Mayville. | 930 Westminster. |
| 913 Eldridge. | 926 Miller. | |
| 990 Gardner. | 898 Montrose. | |
| * Crook City, 50 2 by telephone, Deadwood. | | |
| * Colman, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Dell Rapids, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Egan, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Howard, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Madison, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Pine Ridge Agency, 150 9 Cheyenne Wy. | | |
| * Rosebud Agency, 175 10 Cheyenne, Wy. | | |
| * Spear Fish, 50 2 by telephone, Deadwood. | | |
| * Sturgis City, 50 2 by telephone, Deadwood. | | |
| * W. n. worth, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |

DELAWARE.

67 Klamensal.

FLORIDA.

- * Blue Pond, 75 5, (50 3 N. M. rate) Lake City
- * Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
- * Highland, 50 4 Lake City.
- * Kissimmee (N. M.), 150 10 Lake City.
- * Lochble Sta. 75 5 (50 3 N. M. rate) Lake City.
- * Micanopy 75 5 (50 3 N. M. rate) Lake City.
- * Paola, (N. M.) 100 6 Lake City.
- * Perry Junction, 75 5, (50 3 N. M. rate) Lake City
- * Toool, (N. M.) 50 3, Lake City.
- * Waits Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

| | | |
|--------------------------------------|--------------------|--------------|
| 307 Dubois. | 176 Johnston. | 246 Roswell. |
| 346 East Point. | 226 Lawrenceville. | 226 Suwanee. |
| 187 Folkston. | 186 Perkins Junc. | |
| * Abbeville (N. M.) 40 3 Ft. Gaines. | | |
| * Arlington, 40 3 Ft. Gaines. | | |
| * Blakely, 40 3 Ft. Gaines. | | |
| * Senola, (N. M.), 25 2 Newnan. | | |

IDAHO.

| | | |
|-------------------|---------------|------------------|
| 978 Arimo. | 970 Dry Lake. | 970 The "Front." |
| 970 Ocoocua Lake. | 970 Rathdrum. | |

ILLINOIS.

| | | |
|-------------------|-----------------------|-------------------|
| 316 Algonquin. | 353 Chesterfield. | 358 Palmyra. |
| 300 Allendale. | 307 Danmar. | 316 Richmond. |
| 307 Alpina. | 346 Forrester Junc. | 309 St. Maria. |
| 336 Annawap. | 318 Gaya. | 299 Sidell. |
| 328 Beecher City. | 318 Hazel Dell. | 318 Stockton. |
| 307 Effingham Co. | 307 Mannheim. | 344 Union Grove. |
| 329 Belknap. | 309 Monrovia, Kiffin. | 348 Wann. |
| 298 Bonfield. | 307 ham Co. | 309 West Liberty. |
| 299 Boston. | 307 New Lebanon. | 318 Westfield. |
| 337 Breckenridge. | 347 Oakford. | |

INDIANA.

| | | |
|--|-------------------|----------------|
| 283 Briant. | 283 Letts Corner. | 261 Ossian. |
| 300 Cynthiana. | 298 Lowell. | 290 Paxton. |
| 251 Daleville. | 241 Maples. | 298 Rose Lawn. |
| 260 English Lake. | 262 Miroy. | 271 Sedalia. |
| 299 Fountain Vigo Co. | 280 Monon. | 263 Westport. |
| 300 Ingles. | 300 New Harmony. | |
| | 300 Owensville. | |
| * Ferdinand. By mail, Ferdinand Station. | | |
| * Illiana, free, by telephone, Dana. | | |
| * St. Meinrad. By mail, Ferdinand Station. | | |

IOWA.

| | | |
|-----------------------|-------------------|----------------------|
| 426 Angus. | 407 Girard. | 455 North Boro. |
| 887 Ashton. | 426 Hardy. | 416 Pilot Mound. |
| 426 Bancroft. | 416 Harcourt. | 417 Polo. |
| 426 Bradgate. | 426 Herndon. | 346 Riggs, Ok. Pres- |
| 346 Browns, Ok. Pres- | 426 Irvington. | ton. |
| | 416 Kamrar. | 426 Rutland. |
| 387 Buffalo. | 454 Irwin. | 473 Salix. |
| 426 Burt. | 435 Kallio. | 367 Sand Spring, Ok. |
| 426 Cliva. | 445 Kirkman. | Anamosa. |
| 426 Cooper. | 388 La Orew. Ok. | 416 Thor. |
| 426 Dakota City. | Hamill. | 416 Thrall. |
| 387 Donahue, Ok. | 435 Lake City. | 407 Van Cleave. |
| Dixon. | 407 Laurel. | 417 Van Wert. |
| 387 Fairport. | 397 Libertyville. | 387 Viola, Ok. Stone |
| 435 Farnhamville. | 435 Lohrville. | City. |
| 416 Galt. | 387 Montpelier. | 426 West Bend. |

KANSAS.

| | | |
|--|---------------|---------------------|
| 517 Alum Creek. | 503 Crawford. | 448 Mulberry Grove. |
| 456 Argentine. | 527 Edmond. | 503 Strong City. |
| 456 Barclay. | 514 Galva. | 518 Valley Center. |
| 521 Chase. | 507 Hamilton. | 475 Wakarusa. |
| 427 Cleveland. | 508 Horton. | 466 Westphalia. |
| 517 Clifton. | 527 Lenora. | |
| 507 Collyer. | 507 Leonard. | |
| * Cottonwood Falls, 50 0 Strong City. | | |
| * Enterprise, 15 0, by telephone, Detroit. | | |

KENTUCKY.

| | | |
|---|-----------------|-------------------|
| 263 Bloomfield. | 253 Glencoe. | 263 Taylorsville. |
| 263 Crescent Hill. | 248 Pine Hill. | 389 Wickliffe. |
| 263 Finchville. | 263 Rocky Hill. | |
| * Clay Lick, 25 1 by telephone, Worthville. | | |
| * Coombs Ferry, 25 3 Lexington, Ky., or 45 8 Hunting- | | |
| ton, W. Va. | | |
| * Eastern Junc., 50 3 Lexington, Ky., or 35 2 Hunting- | | |
| ton, W. Va. | | |
| * East Ky. Junc., 35 2 Huntington, W. Va. | | |
| * Flemingsburg, 15 2 by telephone, Johnson Junc. | | |
| * Gistville, 25 1 by telephone, Worthville. | | |
| * Gratz, 25 1 by telephone, Worthville. | | |
| * Kilgore, 30 2 Hunti gton, W. Va. | | |
| * Lockport, 25 1 by telephone, Worthville. | | |
| * Marion, 15 1 by telephone, Worthville. | | |
| * Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, | | |
| W. Va. | | |
| * Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. | | |
| Va. | | |
| * Pine Grove, 50 3 Huntington, W. Va. | | |
| * Port Bille, 25 1 by telephone, Worthville. | | |
| * Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va. | | |
| * Springport, 20 1 by telephone, Worthville. | | |

LOUISIANA.

| | | |
|---|--------------------|------------------|
| 424 Boyce. | 414 Leocropte. | 433 Robeline. |
| 424 Bois. | 434 Mermontean. | 442 San Patrice. |
| 424 Garland. | 433 Moreland. | 433 Snnott. |
| 423 Gloster. | 442 Pleasant Hill. | 442 Stonewall. |
| 442 Grand Cane. | 433 Provençal. | 424 Whitesville. |
| 384 Lookout. | 433 Pradomme. | |
| * Atchafalaya Crossing, 50 3 (30 2 N. M. rate), New Or | | |
| leans. | | |
| * Baton Rouge Junc., 10 3 (30 2 N. M. rate), New Orleans. | | |
| * Fodoché, 50 3 (30 2 N. M. rate), New Orleans. | | |

- * Goudeboro, 50 3 (30 2 N. M. rate), New Orleans.
- * Gross Tate, 50 3 (30 2 N. M. rate), New Orleans.
- * Plaquemine, 50 3 (30 2 N. M. rate), New Orleans.
- * St. James, 50 3 (30 2 N. M. rate), New Orleans.
- * Vacherie, 50 3 (30 2 N. M. rate), New Orleans.
- * W. Baton Rouge, 50 3 (30 2 N. M. rate), New Orleans.

MAINE.

4 Presque Isle.

MANITOBA.

| | | |
|------------|-----------------|--------------------|
| Austin. | Portage La Pra- | Sewell. |
| Brandon. | rie sta. | St. Boniface Junc. |
| Jewinton. | Reburn. | Westbourne. |
| Gladstone. | Rosser. | West Lynne. |

The above named offices in Manitoba should be checked direct at the Manitoba State rate.

MARYLAND.

| | | |
|--|---------------------|------------------|
| 55 Ashland. | 77 Marlboro. | 54 Pocomoke Sta- |
| 77 Bowie. | 67 Octorara. | tion Ok. Poko- |
| 67 Edgewood. | 85 Odenton. | moke City. |
| 85 Lutherville. | 54 Peninsular Junc. | |
| * Gaithersburg, 25 2 Baltimore. | | |
| * Hyattsville, 25 2 Baltimore, Md., or Washington, D. C. | | |

Charge for three extra words in messages to Gaithersville and Hyattsville, and accept only prepaid day messages.

MASSACHUSETTS.

| | | |
|--|---------------------|--------------------|
| 26 Conway. | 21 Wellesley Hills. | 12 W. Harwich, Ok. |
| Dennisport. | | |
| * Asylum Sta., 75 0 Danvers. | | |
| * Bass River Harbor, free by telephone, So. Dennis. | | |
| * Cochemett, 25 0 by telephone, East Bridgewater. | | |
| * Collins' Mills, Dracut, 15 1 by telephone, Lowell. | | |
| * Danvers Centre, 25 0 Danvers. | | |
| * Danvers Insane Hospital, free by telephone, Salem. | | |
| * Danversport, 25 0 Danvers. | | |
| * Dracut Navy Yard, 15 1 by telephone, Lowell. | | |
| * Forge Village, 15 1 by telephone, Lowell. | | |
| * Gardner, 15 0 Gardner Depot. | | |
| * Graniteville, 15 1 by telephone, Lowell. | | |
| * Hyannisport, 15 0 by telephone, Hyannis. | | |
| * Lunenburg, 20 0 by telephone, Fitchburg. | | |
| * Methfield, 50 0 East Bridgewater. | | |
| * Melrose Highlands, 25 0 Melrose. | | |
| * Middlesex Village, 15 1 by telephone, Lowell. | | |
| * No. Middleboro, 150 0 Middleboro. | | |
| * Phenix Village, Tewksbury, 15 1 by telephone, Lowell. | | |
| * Rock, 150 0 Middleboro. | | |
| * South Billerica, 15 1 by telephone, Lowell. | | |
| * So. Gardner, 15 0 Gardner Depot. | | |
| * South Mills, 10 0 by telephone, New Bedford. | | |
| * Weentham, 35 0 by telephone, Providence, R. I. | | |
| * West Bridgewater, 15 0 by telephone, East Bridgewater. | | |
| * W. Chelmsford, 15 1 by telephone, Lowell. | | |
| * W. Danvers, 150 0 Danvers. | | |
| * Westford, 25 0, Westford Depot. | | |
| * Westford Depot, 15 1 by telephone, Lowell. | | |
| * West Gardner, 15 0 Gardner Depot. | | |

MEXICO.

- * Paso del Norte, 50 0 El Paso, Tex.
- * Parral de Hidalgo, 450 43 Brownsville, Texas.

MICHIGAN.

| | | |
|---|--------------------|--------------------|
| 138 Beaver Lake. | 230 Garfield. | 251 North Fayette. |
| 220 Beech. | 137 Hobart. | 251 North Morenci. |
| 281 Bridg-water. | 127 Indian River. | 250 Orleans. |
| 211 Britton. | 231 Jerome. | 260 Ransom. |
| 210 Brockway Centre | 119 Manistee Junc. | 260 Shelbyville. |
| 250 Orapo. | 210 Marlette. | 127 Topinabee. |
| 210 Fostoria. | 210 Mayville. | 127 Vanderbilt. |
| 127 Freedom. | 260 Moline. | 100 Welland. |
| 119 Free Soil. | 127 Mullet Lake. | 127 Wolverine. |
| * Flushing, 15 0 by telephone, Flint. | | |
| * Monising, 40 3 (30 2 N. M. rate), Marquette. | | |
| * Newberry, 40 3 (30 2 N. M. rate) Marquette. | | |
| * Palma, 40 3 (30 2 N. M. rate) Marquette. | | |
| * St. Ignace, 40 3 (30 2 N. M. rate) Marquette. | | |
| * Seney, 40 3 (30 2 N. M. rate) Marquette. | | |

MINNESOTA.

| | | |
|---|-----------------------|--------------------|
| 190 Argyle. | 865 Minnetonka. | 892 Slayton |
| 865 Arlington. | 887 Mission Creek. | 876 Vernon Centre. |
| 875 Buffalo Lake. | 890 Munkoda. | 865 Waconda. |
| 870 Green Is'd. | 870 Oakawa. | 865 Winthrop. |
| 889 Kennedy. | 869 Rock Island Quar- | |
| 861 Minnetonka. | ry. | |
| * Currie, 35 2 Tracy. | | |
| * Deforest, 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis., or | | |
| 35 2, Sioux Falls, Dak. | | |
| * Prairie Junc., 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis., | | |
| or 35 2 Sioux Falls, Dak. | | |

MISSISSIPPI.

| | |
|---------------------------------|-------------|
| 351 Courtland. | 363 Morton. |
| * Arcola, 55 6 Vicksburg | |
| * Johnsonville, 55 6 Vicksburg. | |
| * Stoneville, 55 6 Vicksburg. | |

MISSOURI.

| | | |
|------------------------------------|-----------------|----------------------|
| 427 Ellis. | 437 Lake City. | 437 Sampaal. |
| 369 Etiah. | 428 Montserrat. | 398 Shelbyville. Ok. |
| 427 Gault. | 437 Napoleon. | Shelbina. |
| 383 Knox. | | |
| * Augusta. By mail, Labadie. | | |
| * Greenfield, 50 0 So. Greenfield. | | |
| * Lemons 25 2, Unionville. | | |
| * Pardin, 25 2 Unionville. | | |

MONTANA.

| | | |
|-----------------|----------------------|------------|
| 957 Iron Butte. | 583 Melrose. | 967 Terry. |
| 955 Keith. | 583 Silver Bow Junc. | |

NEBRASKA.

| | | |
|---------------|------------------|----------------|
| 474 Adams. | 922 Clear Water. | 923 Long Pine. |
| 927 Atkinson. | 464 Gilmore. | 927 Stuart. |
| 588 Chappell. | 37 Inman. | |

* Benckman, (N. M.) 60, 4 Plattsmouth.
 * Burckhard, (N. M.) 35, 2 Plattsmouth.
 * Haysler, (N. M.) 60, 4 Plattsmouth.
 * Liberty, (N. M.) 35, 2 Plattsmouth.
 * Stratton, (N. M.) 53, 4 Plattsmouth.

NEW BRUNSWICK.

3 Albert.
 3 Carleton Sta.
 * Port Elgin, 25 2, Sackville.

NEVADA.

676 Tuning.
 676 Soda Springs.

NEW HAMPSHIRE.

* Chesterfield, 25 0 by telephone, Brattleboro, Vt.
 * Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
 * North Hinsdale, 20 0 by telephone, Brattleboro, Vt.

NEW JERSEY.

41 Brick Church.
 41 Centerville, Pa.
 47 Kingston.
 47 Magnolia.
 47 Valley.
 47 Wayne.
 41 West Orange.

NEW MEXICO.

559 Blossburg.
 559 Carriso.
 559 Coolidge.
 559 Dillon.
 637 Gallup.
 637 Lava.
 637 Morelos.
 637 San Antonio.

NEW YORK.

64 A Union Station, 33 Great Neck, L. I.
 64 A Union Station, 33 Great Neck, L. I.
 64 A Union Station, 33 Great Neck, L. I.
 64 A Union Station, 33 Great Neck, L. I.
 64 A Union Station, 33 Great Neck, L. I.
 64 A Union Station, 33 Great Neck, L. I.

NORTH CAROLINA.

205 Alexander.
 125 Laurel Hill.
 1.4 Jamestown.
 205 Marshall.
 173 Newton.
 144 Rowan Mills.
 194 Warm Springs.
 98 Whiteville.

NOVA SCOTIA.

2 Abion Mines.
 2 Sherbrooke.
 * Baddeck, 25 2 North Sydney.
 * Ingonish, 25 2 North Sydney.

OHIO.

221 Alvada.
 231 Alvordston.
 170 Art n.
 1.1 Brilliant.
 180 Oreston.
 180 Everett, Summit.
 180 Fair Grounds.
 180 Fair Grounds.
 180 Fair Grounds.
 180 Fair Grounds.
 180 Fair Grounds.
 180 Fair Grounds.

OREGON.

701 Beaverton.
 785 Cascade Incline.
 * Alrie, (N. M.) 50 2, Portland.
 * Blue Mountain, 50 5 by telephone, Walla Walla, W. T.
 * Fort Klamath, 50 3, Ashland.
 * Linkville, 50 3, Ashland.
 * Milton, 50 5 by telephone, Walla Walla, W. T.
 * Weston, 50 5 by telephone, Walla Walla, W. T.

PENNSYLVANIA.

81 Anes Fort.
 50 Bery.
 130 Clarendon Depot.
 61 Conyngham.
 140 Corcoran.
 140 Cresco, Monroe.
 58 Dunmore Ck.
 58 Dunmore Ck.
 58 Dunmore Ck.
 58 Dunmore Ck.
 58 Dunmore Ck.
 58 Dunmore Ck.

* Best Sta. 101 Allentown.
 * Centre Point, 101 Allentown.
 * Centreville, Elk Co., free, by telephone, Schanoda.
 * Churchville, Berks Co., 101 Allentown.
 * Clayton, 101 Allentown.
 * Corning, 101 Allentown.
 * Cowanesque Valley, 20 1 by telephone, Lawrenceville.
 * Dillingersville, 101 Allentown.
 * Elmer, 20 1 by telephone, Lawrenceville.
 * Eagle, 101 Allentown.
 * Fairview, 101 Allentown.
 * Fagleyville, 101 Allentown.
 * Franklin, Lehigh Co., 101 Allentown.
 * G. H. Harts, 101 Allentown.
 * Harrison Valley, 20 1 by telephone, Lawrenceville.
 * Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.

* Iron, 101 Allentown.
 * Limerick Square, 101 Allentown.
 * Lower Mt Ford, 101 Allentown.
 * Neffs, 101 Allentown.
 * Nelson, 101 by telephone, Lawrenceville.
 * New Berlin, 101 Allentown.
 * Overbrook, free by telephone, Merion Sta., Mont'y Co.
 * Pleasant Corner, 101 Allentown.
 * R. d Hill, 101 Allentown.
 * Ruchsville, 101 Allentown.
 * Swoegerville, 101 Allentown.
 * Sunnecks, 101 Allentown.
 * Statedale, 101 Allentown.
 * Trappe, 101 Allentown.
 * Wurtz, 25 0 by telephone, Rock.
 * Yellow House, 101 Allentown.
 * Zionsville, 101 Allentown.

* Amherst Harbor, Magdalen Islands, 75 5 No. Sydney, N. S.
 * Etang du Nord, Magdalen Islands, 75 5 No. Sydney, N. S.
 * Grosse Is. e. Magdalen Islands, 75 5 North Sydney, N. S.
 * House Harbor, Magdalen Islands, 75 5 No. Sydney, N. S.

* Barring'on, 25 0 by telephone, Providence.
 * C. epatchet, 25 0 by telephone, Providence.
 * Hamilton, 25 0 by telephone, Providence.
 * Wrentham, 25 0 by telephone, Providence.

* Elacks.
 140 Jacksonboro.

292 Bellevue.
 255 Sunbright.

500 Abbott.
 552 A. bany.
 551 Alexander.
 552 Antelope (South).
 552 Atascosa (South).
 552 Bagwells.
 552 Boracho (South).
 552 Bremen.
 552 Catullai (South).
 552 Cariso Pass (No).
 552 Clear Creek.
 552 Cuero (South).
 552 Sierra Blanca (So).
 470 Encinal (South).
 470 Eddy.
 510 Farmersville.
 460 Forest.
 470 G. latan (South).
 603 Lorena.
 470 Lodi.
 552 Meiz (South).
 470 Maria.
 470 Margaret.
 669 Odessa (South).
 669 Pearsall (South).
 669 San Martin (No).
 603 Temple Junco.

* Aguilares, 50 3 Corpus Christi, or 30 2 Laredo.
 * Benavides, 40 3 Corpus Christi, or Laredo.
 * H. n. d. 25 1 Denison.
 * Kountz, 35 2 Beaumont.
 * Los Angeles, 50 3 Corpus Christi, or 30 2 Laredo.
 * Pena, 40 3 Corpus Christi, or Laredo.
 * Realitos, 40 3 Corpus Christi.
 * Salado, 40 3 Austin.
 * San Diego, 40 3 Corpus Christi, or 50 3 Laredo.
 * Village, 40 2 Beaumont.

27 Miles Pond. Ck. St.
 27 Passumpsic.
 * East Arlington, 10 1 Arlington.
 * Guilford, 10 0 by telephone, Brattleboro.
 * Hartwellville, 20 1 by telephone, No. Adams, Mass.
 * Jacksonville, 25 2 by telephone, No. Adams, Mass.
 * North Stamford, 15 1 by telephone, No. Adams, Mass.
 * Readsboro, 20 1 by telephone, No. Adams, Mass.
 * Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
 * Readsboro, 25 2 by telephone, No. Adams, Mass.
 * Stamford, 15 1 by telephone, No. Adams, Mass.
 * Wells, 15 2 Factory Point.
 * West Arlington, 15 1 Arlington.
 * West Dover, 25 0 by telephone, Brattleboro.
 * Wilmington, 20 0 by telephone, Brattleboro.

123 Afton.
 153 Clifton Forge.
 * Indian Rock (N. M.) 40 3 Richmond.
 * Lairds, (N. M.) 40 3 Richmond.
 * Lee Hall, 30 2 Richmond.
 * New Market Nelson Co., (N. M.) 25 2 Richmond.
 * Salisbury, (N. M.) 40 3 Richmond.
 * Wilton (N. M.) 50 3 Richmond.
 * Yorktown, 40 3 Richmond.

724 Carbonado.
 774 Skagit City.
 722 So Texas.
 733 Touché.
 784 White River.

* Coalmont, (N. M.) 30 2 Greenbrier, W. S. Spgs, or 45 3 Huntington.
 * Janel, w + 10 4 Wheeling or Parkersburg.
 * Lost Creek, 10 4 Wheeling or Parkersburg.

* Talcott, (N. M.) 25 2 Greenbrier, W. S. Spgs, or 50 3 Huntington.
 * Weston, 10 4 Wheeling or Parkersburg.
 * Charge for three extra words in messages, and accept only prepaid day messages.

845 Barnevel.
 806 Calhoun.
 325 Cottage Grove.
 8.6 Dousman.
 552 Hayward.
 325 Jefferson Junc.
 849 Kempster.
 556 Livingston.
 325 London.
 325 Marshall.
 806 No Greenfield.
 847 Randolph.
 806 Spring Meadow.
 306 Wa. ca.

* Sturgeon Bay Canal, 25 2 Horns Pier.
 * St. Josephs Pier, 2 2 Horns Pier.

573 Fossil.
 551 Harper.

WYOMING.
 573 Fossil.
 551 Harper.

NORVIN GREEN.
 President.

TRANSFER SERVICE.
 EXECUTIVE OFFICE.
 WESTERN UNION TELEGRAPH COMPANY.
 New York, April 17, 1882.

To all Transfer Agents and offices.
 On April 1st, 1882, the transfer service was resumed at Jeffersonville, Ind, in J. F. Wallick's district, and on same date Butte, Montana, was added to the list of transfer offices in Class B, and assigned to J. J. Dickey's district.

On May 1st, 1882, the following changes will take effect:
 The transfer service will be discontinued at the following named offices:

IN S. B. GIFFORD'S DISTRICT:
 Fairport, N. Y.
 IN L. C. BAKER'S DISTRICT:
 Bryan, Calvert, Longview and Rockport, Tex.
 IN J. F. WALLICK'S DISTRICT:
 Boone, Ia., will be added to the list of transfer offices in Class C, and assigned to C. Catlin's district.

A new transfer district will be established comprising the following named offices upon the lines of the Great North Western Telegraph Company of Canada.

CLASS A.
 Montreal, Que., Ottawa, Ont., Toronto, Ont.
 CLASS B.
 Hamilton, Ont., Peterboro, Ont.
 Kingston, " Plattsburg, N. Y.
 London, " Quebec, Que.
 Malone, N. Y. Watertown, N. Y.
 Niagara Falls, Ont.

CLASS C.
 Barrie, Ont. Owen Sound, Ont.
 Belleville, " Pembroke, Ont.
 Brantford, " Picton, "
 Brockville, " Port Hope, "
 Chatham, " Prescott, "
 Cobourg, " Sarnia, "
 Collingwood, " Searforth, "
 Cornwall, " Stratford, "
 Galt, " St. Catharines, "
 Goderich, " St. Johns, Que.
 Guelph, " St. Thomas, Ont.
 Ingersoll, " Thorold, "
 Lindsay, " Windsor, "
 Ogdensburg, N. Y. Woodstock, "
 Oshawa, Ont.

Such new district will be under the direction of Mr. Arthur Cox of Toronto, Ontario, to whom all transfer orders will be addressed. The charges for each transfer to an office in Mr. Cox's district will be two per cent. on all sums of \$25 or over, and for smaller amounts 50 cents in each case, and double tolls at regular day rates on a single message of fifteen words between the remitting and paying office.

NORVIN GREEN.
 President.

THE POSTAL CARD.

The postal card is an impressive reminder that we live in an age of haste. Nothing more clearly reflects the spirit which discards formalities than this curt bit of pasteboard, its nature preventing verbosity and compelling the writer to condense and abbreviate his language. The old style of letter writing, leading up to the subject with elaborate and lengthy remark and ending in equally elaborate and lengthy terms, is steadily disappearing. It belongs to a time when quill-pen making was an accomplishment and missives were sealed with wax and a lighted taper. The envelope, with its gummed edges, was the first innovation on the old order of things.

In the course of time such phrases as "Believe me, your obedient servant," have been reduced to simply "yours," and the postal card is only a step in the path of brevity. The article has been met with a storm of abuse. It has been asserted that he who cannot spare the time to enclose a letter in an envelope and affix a stamp is not capable of conducting a correspondence. But in spite of all opposition the postal card has been hailed as a boon by the letter-writing public.

The idea of the postal card is said to have originated with a German official, Dr. O. Stephan. Austria was the first country to adopt it, beginning in 1869, and the first three months' trial saw 2,930,000 cards passed through the mails. Germany followed the example of Austria in 1870, and the first day after the introduction of the card 45,463 were sent from Berlin alone. During the Franco-Prussian war the postal card acquired great popularity in both armies. The United States is the great consumer of postal cards, the number used annually being not far short of 23,000,000. All Europe uses about 350,000,000 annually. There are now said to be seventy-three countries which have adopted the postal card, and in the one which first adopted it, Austria, we are informed that the card is of the poorest material and most inconvenient form.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

P. O. Box 3175, New York.

ASSESSMENT No. 150.—March 20, 1882.

JOSEPH E. RANNEY.

HUBERT L. GRAMZOW.

JOSEPH E. RANNEY died at Peoria, Ill., Feb. 17, 1882, of Consumption. His certificate, No. 1953, was issued April 2, 1873.

The above estate will be paid from surplus.

HUBERT L. GRAMZOW died at Ogden, Utah, Feb. 21, 1882, of Dropsy. His certificate, No. 3189, was issued Nov. 15, 1877.

One dollar is due to meet this assessment, from members holding Certificate up to and including No. 4,700.

The number of members of the Association in good standing is: 1st Division, 2183; 2nd division, 130.

Remittances will be acknowledged by Agents of the Association when postage or postal card is enclosed; and an Agent's receipt is a sufficient voucher for all dues from Members. Remit by draft, express, P. O. order, or registered letter. Money forwarded by mail or messenger will be at the risk of sender. A number of assessments may be paid in advance, to avoid small remittances.

BY-LAWS—SECTION VIII. "Upon the death of a member of the Association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and in case payment shall not be made within 30 days thereafter, the delinquent shall forfeit all claim to the benefits of the Association; and should payment not be made within 60 days, shall forfeit membership, to which said delinquent can only be restored as provided in Section VII. of these By-Laws."

N. B.—AGENTS, especially those recently appointed, are—in accordance with Section III By-Laws—respectfully reminded that, on the expiration of thirty days from the date of an assessment, all money on hand should be remitted to the Secretary; and they will facilitate the business, and insure accuracy of the records of collections of assessments, by making their return on the first of each month for the current assessment, including all collections on previous ones not yet remitted; and on, say the 10th of the month, a supplementary remittance covering any payments subsequently received by them. By the adoption of this plan but few, if any, numbers of certificates on which assessments may have been paid, will appear in the list of delinquents printed in the JOURNAL OF THE TELEGRAPH.

A. R. BREWER.

Secretary,
New York

P. O. Box. 3177

Operators' Cramps cured by

LITTLE GIANT
FRENCH BATTERY

Relieves Rheumatism
and all Nervous Com-
plaints. Supersedes all
others. Send for circular.
C. E. JONES & BRO.
Cincinnati, Ohio.

FREE!

Complete Instruction in Telegraphy

If you wish to know all about learning Telegraphy, constructing and operating Short Lines of Telegraph, &c., send your address, by postal card or letter, and get J. H. Bunnell & Co.'s Manual of Instruction for Learners of Telegraphy, latest edition, which we will send

FREE OF CHARGE,

to all who apply, by mail or otherwise.

It is the plainest and best book of instruction in Telegraphy ever published, being fully complete in description, explanation and illustrations.

J. H. Bunnell & Co.,

112 Liberty Street, N. Y.

PROPOSALS FOR BLUE VITRIOL.

THE WESTERN UNION TELEGRAPH CO. invites proposals until 12 o'clock noon, Monday, May 8th, 1882, for 6 months' supply of Blue Vitriol, to be a prime article and free from dust and powder. About 35,000 pounds per month, to be delivered at our Supply department in New York, and about 75,000 pounds to be delivered at our Supply Department in Chicago. No charge to be made for freight, cartage or package.

(The quantities named are only estimates, and amounts required may be more or less than those given.)

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the first day of June, proximo, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Co. may require the goods contracted for.

Bills to be paid between the 15th and 25th of each month following the deliveries.

The right is reserved to reject any and all bids, or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Proposals should be sealed and addressed to the undersigned endorsed,

"PROPOSALS FOR BLUE VITRIOL."

WM. HUNTER,

Sup't Supplies.

New York, April 14th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR ICE.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock noon, Monday, May 1st, 1882, for supplying ice at its building on Broadway and Dey street, for 12 months as follows:

Five months, from June 1st to October 31st, about 40,000 pounds per month, and 7 months, from November 1st to May 31, 1883, 30,000 pounds per month. The deliveries to be made daily (Sundays excepted) between the hours of six and seven o'clock, A. M.

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

The ice to be subject to inspection, and none but clear, good ice will be received, and it is to be weighed as delivered.

Bidders will please state price per hundred pounds for five months, from June 1, 1882, to October 31, 1882, and for seven months, Nov. 1, 1882, to May 31, 1883.

Payments to be made between the 15th and 25th of the month following the deliveries.

The right is reserved to reject any and all bids, or accept any which may seem for the best interests of the Company.

The party whose tender is accepted will be required to give bond with two sureties for the proper fulfillment of the contract.

Proposals should be sealed and addressed to the undersigned, endorsed

"PROPOSALS FOR ICE,"

WM. HUNTER,

Sup't Supplies.

New York, March 25, 1882.

CEDAR TELEGRAPH POLES,

50,000 for SALE, by

H. C. RIPLEY,
East Saginaw, Mich.

SHORTHAND

Writing thoroughly taught
Situations procured for pupils when competent
Send for circular W. G. CHAFFEE, Oswego, N. Y.

I will teach any operator the Corresponding Style of Phonography who will sell a Calligraph for me.

THE

BROOK'S PATENT INSULATORS

WERE AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1867.

At the Vienna Exposition, 1873.

At the Cincinnati Industrial Exposition in 1874.

And at the Centennial Exposition at Philadelphia in 1876.

MANUFACTURED AND FOR SALE BY

DAVID BROOKS,

22 South 21st Street, Philadelphia.

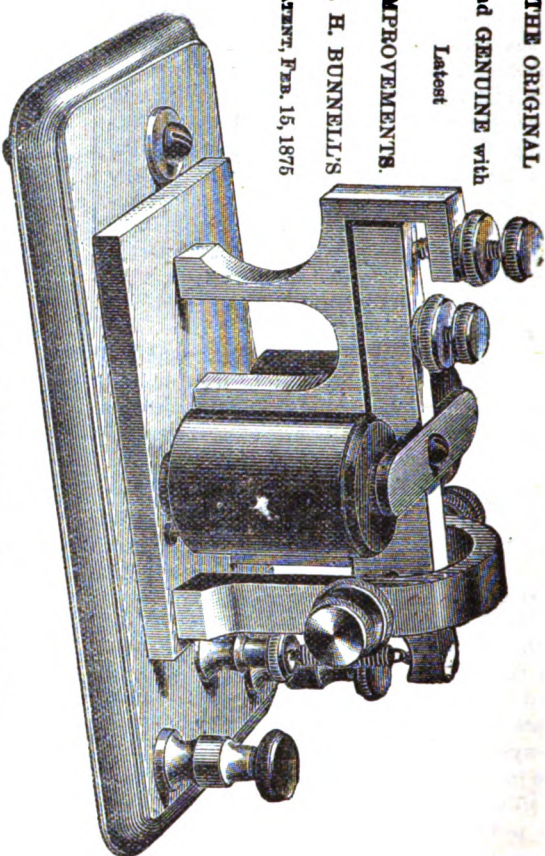
J. H. BUNNELL & CO.'S FIRST CLASS TELEGRAPH MACHINERY.

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS.

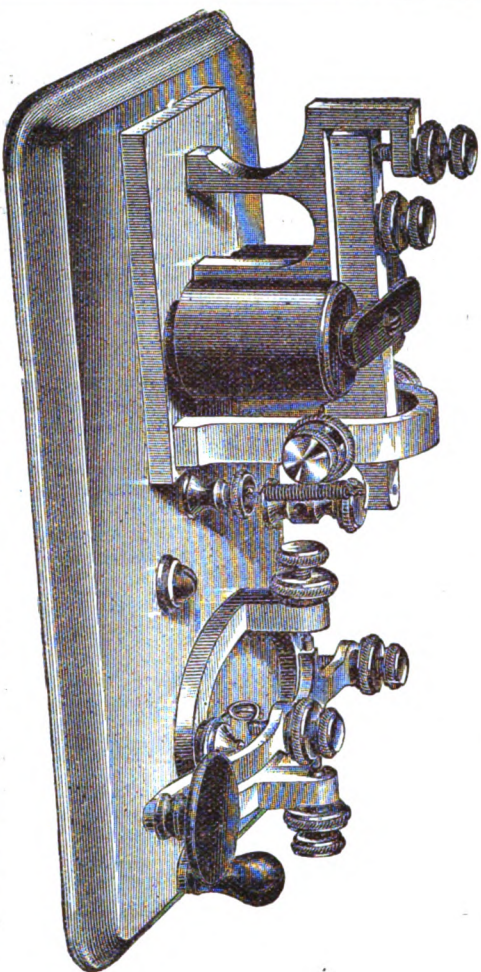
J. H. BUNNELL'S

PATENT, FEB. 15, 1875



THE GIANT SOUNDER—UNEQUALLED!

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$5.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

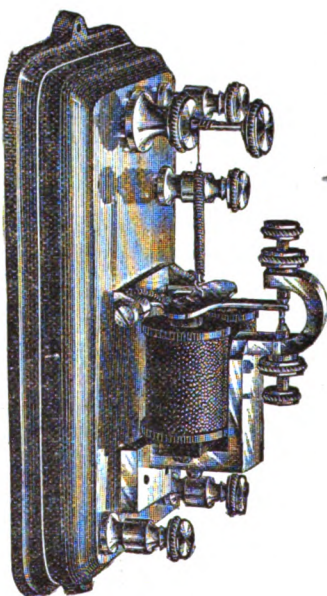
COMBINATION SET:

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE 8.00, carefully boxed and sent by mail, prepaid, to any part of the United States.

All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.

NEW FORM PONY RELAY.
J. H. Bunnell & Co.'s Latest Design.

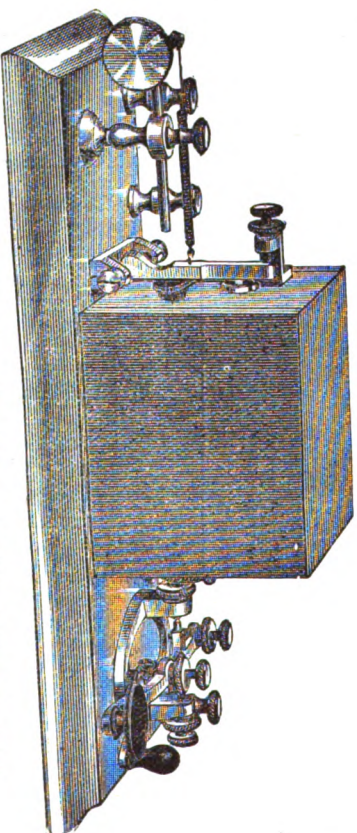


SIZE OF BASE, 6½ INCHES LONG, 3½ WIDE.

These beautiful little Relays are perfect instruments for working any line of less than 75 miles in length.

They are elegantly finished and mounted on polished mahogany base, with ornamental surbase all being exactly as shown above.

Price, wound to 20 or 30 ohms resistance, for lines up to 15 miles in length,..... \$4.00
 " 40 or 50 ohms, for lines 20 to 40 miles..... 4.25
 " 50 to 100 ohms, for lines of from 40 to 75 miles..... 4.75
 " with polished rubber covered magnets, 50 cents extra.
 These relays will be sent, carefully boxed, and postage prepaid by us, to any part of the U. S. upon receipt of price as above.



BOX SOUNDING RELAY AND STEEL LEVER KEY.

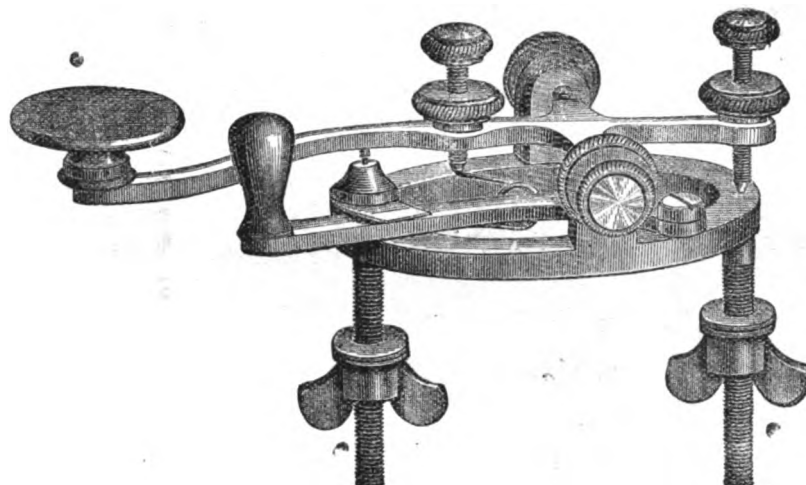
COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire.
 Price, with Steel Lever Key on base, \$12.00; without Key, \$9.00.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:

The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Our Steel Lever Solid Trunnion Key

is now well known throughout the United States and Canadas as being the most satisfactory, durable and perfect key for Morse Telegraphing.

Its great popularity since its first introduction has caused many attempts to produce a key having at least equal merit. But, after two years' trial in thousands of different places, it still remains

“A Number 1,” Ahead of all,

while its competitors drop out and cease to be heard from.

Various absurd contrivances will, no doubt, continue to be put forward as being equal or better keys, but we would say to all who wish to possess a perfect instrument that

“The Bunnell Steel Lever Key”

is beyond all comparison,

THE BEST.

J. H. BUNNELL & CO.,

FIRST-CLASS TELEGRAPH INSTRUMENTS & MATERIALS OF EVERY DESCRIPTION,

112 Liberty Street, New York,

CHARLES WILLIAMS, JR.

(ESTABLISHED IN 1854.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO

Magnet Crank and Push Button Call Bells, Electric Bells,
District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS,

Spare Batteries, Wires, Insulators and

Telephone Supplies of Every Description.

GEO. WESTINGHOUSE, JR., Pres. HAPLON BAGGLEY, V. Pres. & Treas.
O. H. JACKSON, Gen'l Manager. ASAPH T. ROWLAND, Secretary.
HENRY SNYDER, General Agent.**THE UNION SWITCH & SIGNAL CO.,**

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
sole Owners and Manufacturers of the only practically suc-SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Elec-
tricity.Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnish-
ed upon application.

ESTABLISHED 1820.

ALFRED F. MOORE,

(Successor of JOSEPH MOORE & SONS)

MANUFACTURERS OF

INSULATED TELEGRAPH WIRES,

200 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

INSTRUMENT AND OFFICE WIRES. FLEXIBLE CORDS. ANNUNCIATOR
AND BURGALAR ALARM WIRES. ELEVATOR CABLES.All wire used is thoroughly tested for conductivity, therefore
ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP,

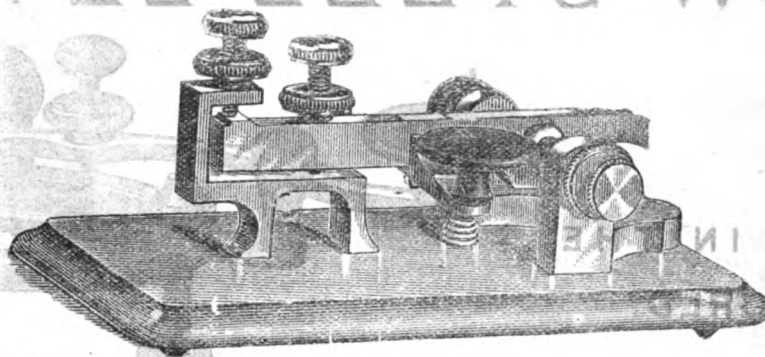
FOR FLEXIBLE CORDS.

Descriptive Circulars furnished upon application.

J. H. BUNNELL & CO.

TELEGRAPH INSTRUMENT

PATENTED APRIL 4, 1882.

**COMBINED KEY AND SOUNDER.**

NO BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is always ready for use.Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or register-
ed letter.

J. H. BUNNELL & CO.,

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

**ILLUSTRATED CATALOGUES
OF MAY, 1882?**If not, send your address by postal card or letter and you will get one by return mail.
It contains Illustrations, descriptions, and the**BOTTOM PRICES**of all things Telegraphic, including the latest and best designs of Telegraph Instru-
ments of every description, together with all Telegraph and Telephone**LINE MATERIALS.**

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of**IMPROVED MODERN TELEGRAPH SERVICE.****J. H. BUNNELL & CO., 112 Liberty Street, New York.****Don't Read This!**Or you will BE SURE to send for our NEW
1882 CATALOGUE, which is proper and
to your interest to do before purchasing else-
where. If you want to be a TELEGRAPH
OPERATOR send twenty-five cents for our
NEW 1882 ILLUSTRATED INSTRUCTION BOOK. It is the MOST COMPLETE instruction book in the world.
C. E. JONES & BRO.: Dear Sirs:—Instruction Book received. O.K., and many thanks. It is worth five times what it cost. If a person
could not learn to be an operator after studying it, they had better give up. Yours truly, A. L. JAMES, Tipton, Tulare County, Cal.
Now! Right Now! while fresh in your mind, is the best time to send your order, before you misplace the
paper and forget our address, and your opportunity is gone. Remittances preferred in currency, i.e. or 2c. stamps.**C. E. JONES & BRO.,**

MANUFACTURERS AND DEALERS IN

TELEGRAPH, TELEPHONE AND ELECTRICAL SUPPLIES.

No. 51 WEST FOURTH STREET, CINCINNATI, OHIO.

A detailed black and white illustration of a large, ornate mechanical device, likely a typewriter or printing press. The machine features a large, cylindrical component on the right side, possibly a paper roll or a large drum, which is connected to a complex system of gears, levers, and a keyboard. The entire device is mounted on a sturdy, rectangular base. The background is a plain, light color, emphasizing the intricate details of the machinery.

Digitized by Google

PARTRICK & CARTER

TELEGRAPHIC SPECIALTIES.

THE GIANT SOUNDER PERFECTED.

Patented Feb. 16, 1875. Most perfect, reliable, clear toned; fine finish, and warranted the best working sounder in existence. Price, by mail, \$5.00.

THE "LATTIG" AUXILIARY LEVER NON-STICKING KEY.

PATENTED AUGUST 16, 1881. PRICE, \$5.00, BY MAIL.

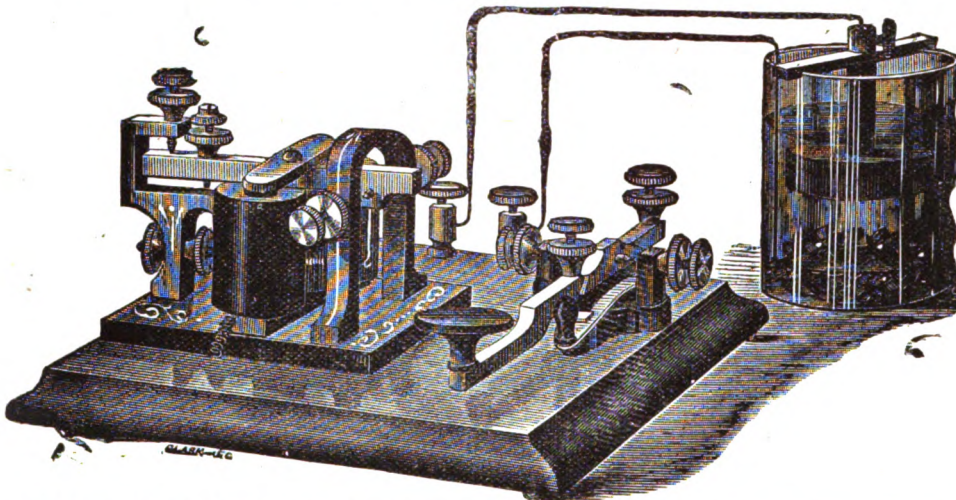
This Key is very fine finish nickel-plated, and presents a beautiful appearance, is easy to handle and WARRANTED NEVER TO STICK. It has been extensively tried and has received the endorsement of the best operators in the country. It embodies the only true principle to prevent a Key from sticking by having a great separation between the anvil and hammer, without increasing the play of the Key lever, thereby preventing the formation of the "Electrical Arc" between the platina points, which is the PRIMARY CAUSE of Sticking Keys. We claim this Key will never fail to make contact.

"THE EXCELSIOR KEY." (PATENT APPLIED FOR.) PRICE \$2.50 BY MAIL.

This Key is made ENTIRELY OF BRASS NICKEL PLATED, with hardened platina points, and it is put forward to meet the long existing demand for a CHEAP, LIGHT, EASY WORKING, FIRST CLASS KEY, and is without doubt the CHEAPEST and BEST Key EVER OFFERED FOR THE MONEY.

Premium Learners' Apparatus.

Only \$5.00. Not the Cheapest, but Guaranteed the Best.



The PREMIUM LEARNERS' APPARATUS and OUTFIT comprises the famous "NEW GIANT SOUNDER, PERFECTED," and "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Callaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5.00, when the money accompanies the order. The great number of these Instruments use is the best testimonial that can be offered.

Price, Complete Outfit Money in advance, \$5.00
 " Instrument without Battery " " 4.20
 " Instrument without Battery, by Mail " " 4.75
 Remittances should be made by P. O. Money Order, Registered Letter, Draft or Express, which will insure safe delivery. Send for circulars.

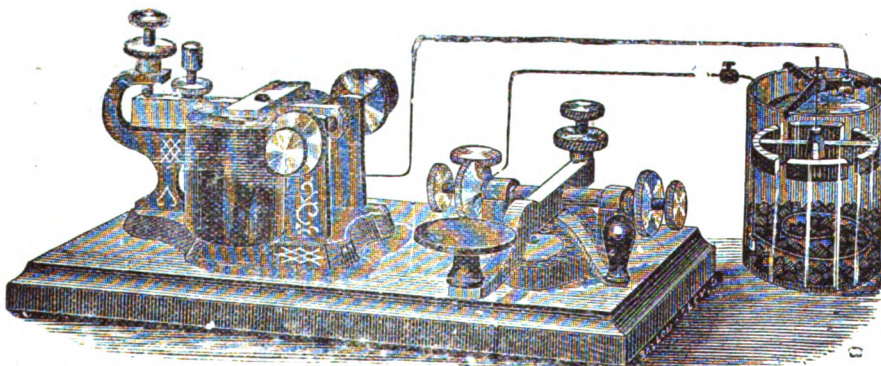
PARTRICK & CARTER,

No. 114 SOUTH SECOND STREET, PHILADELPHIA, PA.,

Manufacturers and Dealers in TELEGRAPH, TELEPHONE, AND ELECTRICAL INSTRUMENTS AND SUPPLIES OF EVERY DESCRIPTION. Send for Catalogues and Circulars.

SEND FOR OUR PRICES BEFORE PURCHASING ELSEWHERE.

EUREKA OUTFIT NO. 2.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

THE ABOVE OUTFIT AND MATERIAL ALL COMPLETE SENT ON RECEIPT OF \$4.25.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

Room 19, Leader Building, Cleveland,

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

2,164 MEMBERS. \$21,640 RESERVE FUND.

The Association respectfully invites attention to its success during the past ten years, having paid to its beneficiaries over \$175,000, and accumulated a reserve fund of \$21,640, interest upon which nearly pays current annual expenses. No officer or agent draws salary or commission. Average annual assessments to each member has been less than \$12.

Any person, of either sex, in good health of not less than 18 or more than 45 years of age, who is employed in telegraphic service, and is otherwise qualified as required by the By-Laws, is eligible to membership; and should a member in good standing leave the Telegraphic Service, but continue to pay all dues assessed and otherwise conform to the Constitution and By-Laws, he can retain his membership.

The initiation fee is \$2. \$1,000 will be paid to the Beneficiary of a deceased member within 60 days after verification of claim; and in the case of a member who has been one year, next preceding date of death—in good standing the claim is indefeasible.

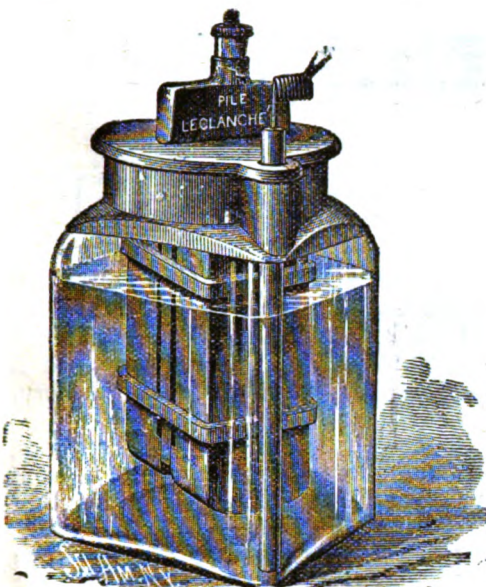
Any one who is or becomes a member in good standing of this Association is also eligible to membership in the new or Second Division. For further information, copies of Constitution and By-Laws, blank applications, etc., apply to any of the following named officers or agents:

OFFICERS:
 CLARENCE GARY, President. O. H. SUMMER, Vice-President.
 A. B. BREWER, Secretary. SAMUEL M. TAYLOR, Treasurer.
EXECUTIVE COMMITTEE:
 CLARENCE GARY, New York. O. H. SUMMER, Chicago, Ill.
 A. B. BREWER, New York. SAMUEL M. TAYLOR, New York.
 W. H. YOUNG, Washington, D. C. F. W. JONES, New York.
 JOHN E. ZIEGLER, Phil. Pa. CHARLES S. H. SMALL, New York.
 JAMES MERRIN, New York.
AUDITING COMMITTEE:
 H. C. ROBINSON, Philadelphia, Pa. T. P. SCULLY, New York.
 B. W. POPE, New York.

AGENTS:
 Albany, N. Y. Charles C. King.
 Augusta, Ga. John W. Brown.
 Atlanta, Ga. J. M. Stephens.
 Baltimore, Md. R. J. Bloxham.
 Bangor, Me. O. E. Bliss.
 Bismarck, Dak. Chas. E. V. Draper.
 Boston, Mass. E. B. Pillsbury.
 Buffalo, N. Y. J. W. Tillinghast.
 Cheyenne, Wyo. Chas. F. Annett.
 Cincinnati, Ohio. G. W. Sheppard.
 Chattanooga, Tenn. Charles H. Skelton.
 Charleston, S. C. J. D. Basterlin.
 Chicago, Ill. J. Uhrig.
 Cleveland, Ohio. H. L. Melton.
 Columbus, Ohio. A. M. Paddock.
 Denver, Col. W. B. Bunde.
 Dubuque, Iowa. F. I. Benson.
 Detroit, Mich. T. W. Hill.
 Elkhart, Ind. S. P. Wilcox.
 Evansville, Ind. N. M. Booth.
 Grand Rapids, Mich. M. D. Benedict.
 Galveston, Texas. David Hall.
 Grafton, W. Va. A. T. Cline.
 Harrisburg, Pa. H. A. Cline.
 Halifax, N. S. Alex. H. Hoyt.
 Hartford, Conn. S. B. Curtis.
 Indianapolis, Ind. F. A. Moore.
 Jackson, Mich. D. S. Fleming.
 Jackson, Tenn. Nelson E. Jacobs.
 Kansas City, Mo. M. D. Wood.
 La Fayette, Ind. H. E. Doolittle.
 Little Rock, Ark. H. C. Newlen.
 Louisville, Ky. Charles Smith.
 Mobile, Ala. B. P. Shreve.
 Montgomery, Ala. E. Winter.
 Memphis, Tenn. H. E. Conley.
 Milwaukee, Wis. D. H. Henshaw.
 Montreal, Quebec. James Kent.
 Nashville, Tenn. A. H. Stewart.
 New Haven, Conn. J. M. Fairchild.
 New Orleans, La. J. T. Allyn.
 No. Sydney, C. B. Nathl. Martell.
 New London, Conn. G. W. Russell.
 N. Y., L. Erie & W. R.R. (21 Cortlandt St. N. Y.) O. D. Reed.
 Oil City, Pa. Frank Ross.
 Omaha, Neb. L. M. Rhoads.
 Philadelphia, Pa. Wm. G. Jones.
 Phillipsburgh, N. J. G. H. Grace.
 Peoria, Ill. J. B. Hammatt.
 Pensacola, Fla. O. L. Le Baron.
 Pittsburgh, Pa. J. E. Palmer.
 Poughkeepsie, N. Y. S. E. Ruple.
 Portland, Me. O. D. Livermore.
 Portland, Oregon. D. F. Leahy.
 Providence, R. I. Jas. S. Hall.
 Reading, Pa. W. H. Bunyon.
 Richmond, Va. W. C. Walstrum.
 Rochester, N. Y. A. J. Stoddard.
 Reno, Nevada. Frank H. Macdonell.
 Sayre, Pa. H. H. Hamilton.
 Scranton, Pa. E. O'Brien.
 Syracuse, N. Y. Luther G. Field.
 St. John, N. B. E. T. Clinch.
 St. Louis, Mo. Geo. W. Brownson.
 St. Paul, Minn. Day K. Smith.
 San Francisco, Cal. A. P. Dubois.
 Savannah, Ga. H. Griffith.
 Springfield, Mass. W. J. Denver.
 Springfield, Ill. W. W. Kelchne.
 Toronto, Ont. J. Lanskill.
 Troy, N. Y. F. D. Adams.
 Toledo, Ohio. E. W. Fish.
 Vincennes, Ind. Perry Hood.
 Washington, D. C. W. H. Young.
 Wheeling, W. Va. Jno. G. Tomlinson.
 White River Junction, Vt. G. W. Gates.
 Wellsville, Ohio. F. Bruner.
 Worcester, Mass. E. W. Bradford.
 Watertown, N. Y. D. Van Nostrand.

A. B. BREWER, Sec'y.
 P. O. Box 3175. New York,
 W. U. R. Building, Room 58.

LECLANCHE BATTERY. (Patented.)



THE GREAT TELEPHONE BATTERY.

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones.

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Plaques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of Infringements and Worthless Imitations.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity
Sine and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,

40 West 18th St., New York.

Or L. G. TILLOTSON & CO.,

5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FIBER.

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE

BURGLAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLES, ETC.

OFFICE AND FACTORY: 67 STEWART STREET.

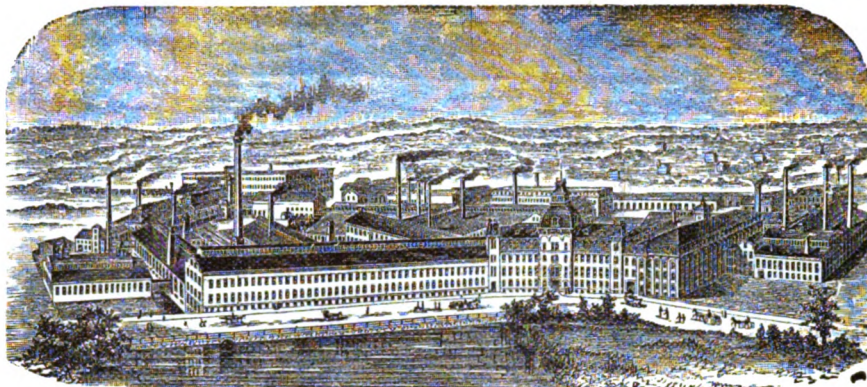
(PROVIDENCE, R. I.)

W. H. SAWYER, Electrician and Sup't.

TELEGRAPH WIRE.

WASHBURN & MOEN MANUFACTURING COMPANY

ESTABLISHED 1861. CAPITAL \$1,800,000.



WORCESTER, MASS.

21 OLIVE STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequaled in that particular.

Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

(In connection with the DOUBLE ROLLERS FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

KERITE INSULATED TELEGRAPH WIRES AND CABLES

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession

THE

DURABLE QUALITIES OF KERITE

RECOMMENDED BY THE

CHEAPEST AND MOST ECONOMICAL

insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation furnished
at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

J. H. HORTON, General Agent.

TELEPHONE WIRE

THE AMERICAN BELL TELEPHONE COMPANY.

W. H. FORBES, President, W. K. DRIVER, Treasurer,

THOS. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

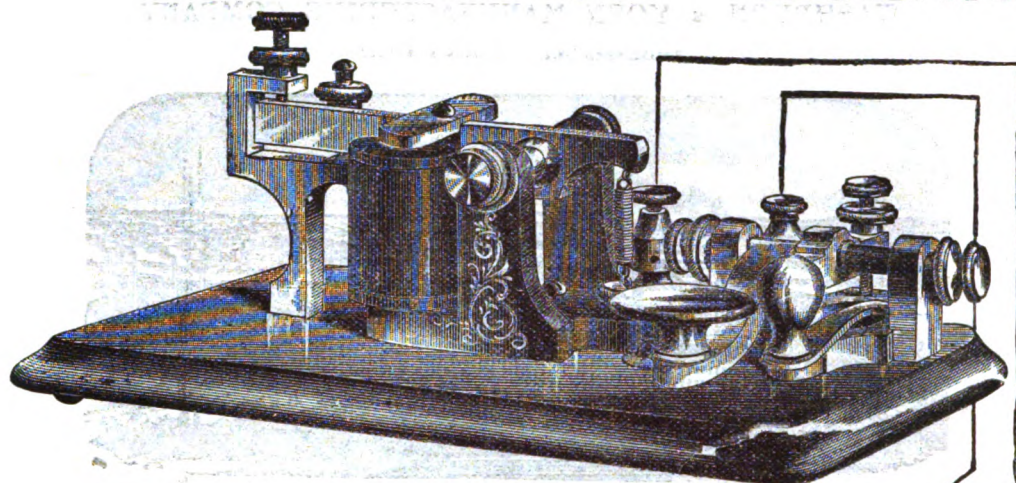
This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

The "Morse" Learners' Outfit.



THE BEST.

Price, \$450, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.

"Morse" instrument alone, without battery..... \$3.80

"Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 4.50

Cell of battery complete..... .65

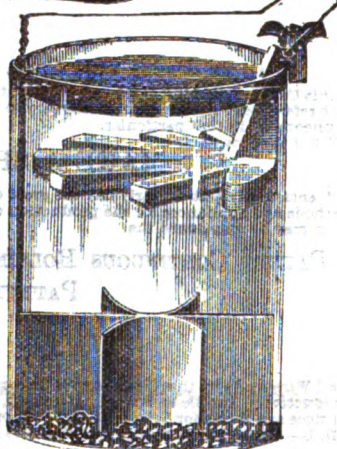
"Morse" Learners' instrument, without battery, sent by mail..... 4.30

(Battery cannot be sent by mail.)

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



THE BEST.

THE "MORSE"

Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners. Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

You are **SURE** of getting
THE BEST THAT IS MADE

IF YOU SELECT THE "MORSE"

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.

YOUR NAME FINELY
printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "1883," or a small and perfect Engine and tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 other designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys, Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents; also Embellished Keys 25 for 25 cents; Cards 10 cents. 60 New and laughable Illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 60 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 25 cents. 25 side-splitting Comic Cards, 25 cents. Morocco card cases, two pockets, 100. 100 finely printed letter heads, \$1.00. 100 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 100. Agents Wanted to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also set in fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and Slipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200 no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from 3 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,

F. P. MUNN, CLYDE, Wayne Co., N. Y.

also Embellished Keys 25 for 25 cents; Cards 10 cents. 60 New and laughable Illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 60 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 25 cents. 25 side-splitting Comic Cards, 25 cents. Morocco card cases, two pockets, 100. 100 finely printed letter heads, \$1.00. 100 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 100. Agents Wanted to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also set in fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and Slipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200 no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from 3 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,

F. P. MUNN, CLYDE, Wayne Co., N. Y.

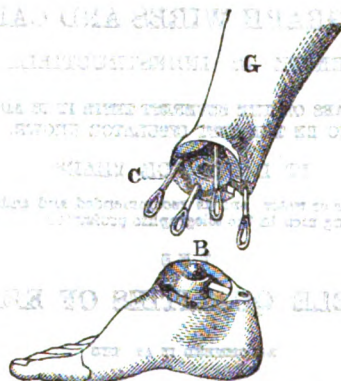
WESTERN UNION TELEGRAPH COMPANY,
New York, March 8, 1884.

DIVIDEND No. 59.

The Board of Directors have declared a quarterly dividend of ONE AND ONE-HALF PER CENT. upon the capital stock of this Company from the net revenues of the three months ending March 31st, instant, payable at the office of the Treasurer on and after the 15th day of April next, to shareholders of record on the 18th day of March, instant.

The transfer books will be closed at three o'clock on the afternoon of the 18th of March, instant, and re-opened on the morning of the 17th of April next.

R. H. ROCHESTER, Treasurer.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
With or without universal ankle motion. Remodeled, improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.

GEO. R. FULLER,
Successor to Dr. D. BLY, Rochester, N. Y.

**BEST TELEPHONE EXCHANGE
SWITCH BOARD.**
IN THE WORLD.

SUPERSEDING ALL OTHERS.

Sample and Circulars sent to Exchanges on

Application to

C. E. JONES & BRO.,

CINCINNATI, OHIO.

WESTERN SCHOOL OF TELEGRAPHY.

JANESVILLE, WISCONSIN.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement, now of eight years standing, with the system of city lines in Chicago known as the Metropolitan Telegraph Company, having over 100 offices, and worked in connection with the Western Union Telegraph Company. These city lines draw their operators from this school, placing them first in sending offices and afterwards promoting them according to merit. The superintendents of telegraph of the different railroads centering at Chicago, employ many men from the city lines, and the Western Union Company does the same, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make of our students first class operators, nor to obtain for them first class situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

RICHARD VALENTINE,
A. M. VALENTINE, MANAGER.

N. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have lately furnished the following Companies in this way: Wisconsin Central, Green Bay & Minn., St. Paul, Winnebago, & Marquette, Chicago, St. Paul, Minneapolis & Omaha and Burlington & Northwestern.

We can also furnish, on short notice, experienced operators competent to manage any ordinary office, and reliable in every respect.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, MAY 20, 1882.

WHOLE NO. 347.

SUN HEAT, SUN LIGHT, AND MAGNETISM.

LECTURE BY DR. H. R. ROGERS BEFORE THE ACADEMY OF SCIENCE, IN ROCHESTER, N. Y.

PHYSICAL science to-day is essentially progressive and aggressive. Yesterday's goal becomes to-morrow's starting point. Recent discoveries and inventions foreshadow a coming revolution in scientific thought. The last half century has laid a broad and immutable foundation upon which the future will erect a new and true philosophy. This foundation is the law of "conservation of force."

To-night it will be my endeavor to disturb the quiet in which repose the present theories of heat and light. I shall present these forces from the standpoint of that immutable basis. I ask your attention now to the subject of Sun heat and Sun light. The demonstrations of our senses, as well as the teachings of all the ages, lead us to attribute to the sun the possession of a most dazzling brilliancy and an unlimited amount of heat. So it certainly appears. Yet the simple fact that the earth receives its heat through the agency of the sun is not conclusive evidence that the sun is itself hot. Heretofore it seems not to have been even suspected that there might be a cause or agent of heat that should not itself be hot, and that there might be a producer of light that should not itself be brilliant. In these latter days, not only has the possibility of this become a growing conviction, but the fact has been abundantly demonstrated.

It is well known that heat rapidly diminishes as, leaving the earth's surface, we go in the direction of the sun. It is also well known that at the altitude of less than two miles lies the line of perpetual frost; the temperature of space progressively lowering beyond that point. More than all this, science teaches as a fact that the space that separates the earth and sun, and which is estimated to be about ninety-two millions of miles in extent, is inconceivably cold. Some idea of the intensity of the cold of space may be conceived from the scientific estimates, which range from a few hundred degrees to eighteen millions of degrees below zero (Fahrenheit). Now, it seems incredible that scientists, who hold such an opinion, should at the same time entertain the thought, and attempt to maintain the theory, that heat actually comes from the sun as heat, through such a distance, and through so cold a medium. If heat, therefore, can by no possibility come from the sun to the earth as actual heat, then, consequently, there can be no necessity for the development of heat at the sun. We, therefore, claim no great wisdom in asserting that all existing philosophies concerning the functions of the sun are fundamentally erroneous. These rational and simple considerations forcibly thrust upon every thinking mind a problem to solve. The science of the period admits of four different explanations of the production of sun-heat, viz.: First, combustion of cosmical bodies falling into the sun; second, the arrest of motion of

bodies, thus supposed to be constantly falling into the sun; third, the contraction of the solar mass; and fourth, the dissociation of compound bodies in the sun's substance. Concerning these explanations, we would say that they so outrage every sentiment of enlightened reason, and so ignore the clearest teachings of common philosophy, that it cannot be regarded as a severe judgment if we pronounce them mere make-shifts. They have been accepted only for want of better ones.

First and most prominent among them all, is the old combustion hypothesis, which, though bearing the seal of ages, is obnoxious to both common and philosophic reasoning. It involves a consumption of material beyond all conception, the supplies for the maintenance of which have been no small tax upon the scientific imagination. The source of this supply has been claimed to be the subsidence into the sun of useless worlds, that are thus utilized to keep up its furnace fires much as the sawdust and shavings of a lumber dressing establishment are in mundane economy. Asteroids and meteors are supposed to be showered down upon the sun's surface. Indeed, estimates have been carefully prepared, and we are gravely informed of the probable amount of combustible material required to meet the sun's demands for stated periods. This, of course, makes a fascinating mathematical study. It is, for example, picturesquely represented that the coal fields of Pennsylvania, which are reckoned capable of supplying the world's consumption for centuries, would keep the sun's rate of heat-emission good for considerably less than one-thousandth part of a second. Pouillet estimated the quantity of heat emitted by the sun per hour to be equal to the supply afforded by a layer of anthracite coal ten feet thick spread over the whole surface of the sun. Such calculations are highly pleasing to the fancy, yet nevertheless suggest great expense and wastefulness. The "combustion" hypothesis is virtually given up by scientists on account of its insuperable difficulties. The fuel problem is too intricate for even the profoundest finite mind.

The second, or so-called mechanical hypothesis, is held in greatest favor by scientists to-day, as best accounting for the phenomena, or, it were better to say, as being a little less vulnerable to objections. This improved hypothesis pre-supposes the presence in space of an incalculable supply of ponderable masses, all roving loosely and by chance, until such time as they fall within the range of the sun's influence and are drawn thereto with such momentum that the concussion gives mechanical rise to an inconceivable heat and light. Concerning this hypothesis, we say that it is one which endows chance with majestic virtues, with supreme mathematical calculation, since it is credited with affording a most exact and definite supply of needed heat and light, ever without excess and without deficiency. How wonderfully stored are these heat-producing bodies, that they should be always on hand in the

right measure when required! But, really, what evidence have we of the existence of such ponderable matter wandering about the universe, and always convenient at hand? Our fertile imaginations only. We make aerolites, meteorites and meteors, so-called shooting stars, do excessive duty when we build up so huge a system from their comparative insignificance. Our data are insufficient for it. Briefly, this mechanical theory points to inevitable enlargements of the sun's dimensions from the accretions added, which would be an element of a most disastrous disturbance. Besides, our knowledge gives no warrant for such a belief.

The third hypothesis, "the contraction of the solar mass," implying, as it does, a continual diminution of that body, finds itself in a similar antagonism to the law of conservation of force. It involves the destruction of the nice balance of things.

The fourth hypothesis, or "dissociation of compound bodies in the sun's substance," is but the old combustion theory in a modern chemical garb. It leads, like all the rest, to the logical conclusion that there is a certain evolution of this universe into ultimate disorder and destruction. The present philosophy, therefore, let it be explained as it may be, is found to lie open to insuperable objections.

We now turn towards a philosophy which is a logical outcome, whether yet recognized as such or not, of the latest and best scientific ideas. We are brought face to face with the law of conservation of force. This law must now be recognized as the basis of all physical philosophy. This law receives the full and unqualified indorsement of all true scientists, and no view of force can henceforth be entertained which is incompatible with it. It must be laid hold of as the key of all philosophy. The death-warrant of the afore-mentioned hypotheses is that they antagonize this fundamental law. Now, according to this law's decrees, whatever is received by the earth from the sun, an equivalent for the same must again be returned from the earth to the sun. We are led to suspect that the earth does return to the sun some equivalent for value received; yea, an equivalent exact even to the uttermost fraction.

To return to the four hypotheses; each one of them pre-supposes that a vast flood of heat and of light incessantly issues from the solar mass, and proceeds hither to our earth, with an inconceivable velocity; yet neither of them makes provision for the necessary return current. They conserve nothing. They start upon the assumption that there is present at the sun's surface, or in its envelop, both actual heat and light, as chief elements of the solar economy. This fundamental assumption we will now reject, and see with what results. Governed by the appearance of things, as reported literally to us by our senses, the sun has been conceived of us all alone, the sole developer and dispenser of the forces; and as a result, the earth has been assigned no important determining agency in the production

of them. But the law of conservation of force now comes in to compel us to look to our earth, the heretofore neglected factor in the problem.

Behold, now! the earth becomes to us an object of study in a way before unsuspected. We had supposed that it was necessary to travel to the sun to take a stand from which to explore the mysteries of heat and light. On the contrary, I ask you to begin right here where we stand. The earth, besides the slight crust on which we dwell, and its gauzy envelope, the atmosphere, contains a core, to a greater or less extent and degree incandescent and measuring 250,000,000,000 of cubic miles in magnitude. As we consider this vast inclosed mass of incandescent matter, the thought strikes us that herein must lie influence and power. As nothing in nature is useless it cannot be idle. We are compelled to assign to it some authority and efficiency commensurate with its immensity. So vast, so preponderating an element in our globe, cannot be safely left out of account. We may rationally assume that it performs stupendous and marvelous functions, such as have never been conceived of in man's philosophy. Why should it not have a governing agency in determining the coming of heat and light, the quality of that heat and light, its quantity too? For similar reasons, the constitution of the earth's atmosphere becomes an element of vital importance, as regards the philosophy of heat and light. Who shall say that it does not need the conjunction of sun, earth-bulk and atmosphere for any development of these forces? Without an atmosphere there might be neither heat nor light, here, though the sun existed the same as now.

The fact that the atmosphere is a vast magnetic reservoir, that it is the most magnetic of all earthly bodies except iron, nickel and cobalt, is well understood; yet there appears to have been no adequate idea of the grandeur and importance of this fact. The clouds, vapors, gasses of the air have been regarded, but in no adequate way has this magnetic element been recognized. In no scientific formula of the constitution of the atmosphere has this constituent been recognized as a real entity. The atmosphere is thus peculiarly adapted to co-operate with the sun; it is the medium, the instrument of all the sun's terrestrial operations. By means of the dynamo-electric machine there has been the demonstration of the fact of a ready conversion of motion and magnetism into heat and light. Does not analogy suggest that the grand motions of the magnetic sun and the magnetic earth are by the same principle converted into sun-heat and sun-light? The electric current developed by the dynamo-electric machine discloses no evidence of its existence while its passage continues unobstructed. The machine itself and the conducting wires are dark and cold. But through resistance its unseen powers are brought into manifestation. If a carbon point or a platinum coil be placed between the divided ends of its conducting wires, its hitherto unobserved force is manifested in a marvelous exhibition of heat, light, and power.

The object of resistance to the sun's current earthwards is our atmosphere, which supplies the necessary conditions represented by "carbon point" and "platinum coil" in practical electricity. A current, invisible, without manifestation passes through space as electricity through wires, until, meeting the resistance and favorable conditions of our atmosphere, there occur those wonderful and important phenomena, heat and light. No particle of either heat or light need, therefore, come as such from the sun to the earth, the current being wholly invisible and cold in its passage. The existence of such a current earthward is not doubted by any one,

but the law of magnetic action, as well as the law of conservation of force, requires the recognition of a return current. Solomon was wiser in some respects than the scientists of the present day. He said: "The wind returneth again according to his circuits. All the rivers run into the sea, yet the sea is not full; unto the place from whence the rivers come thither they return again." Science recognizes the immense movement of force from the sun to the earth; but has she made sufficient account of the fact that the earth is not full? Has she seen clearly that the rivers of energy have their ceaseless circuits, that they go forth and return to the place from whence they started? This is what the law of "conservation" demands, and it is what the electrical theory alone affords.

Let the dynamo-electric machine be to us an interpreter to translate the language of universal phenomena. It can be made to develop heat, light and power, while being itself neither hot, luminous nor magnetic. It may develop them not only in its immediate presence, but in the next house, or in the next city. It suggests that the sun may be neither luminous nor hot, and yet do the same. It teaches that potential action generated in a dark, cool body, may produce great heat, light and attraction, at a distance from the seat of activity; and what we can work artificially in a small way may surely be done naturally, and in a tremendous fashion, by the grand forces of the sun.

Suppose lines be drawn from the sun to the earth, tangent to both; these lines will enclose a tapering space, the sun at the big end, and the earth at the small end, giving the space the form of a truncated cone. We may call the space the solar cone. Within this space there is an incessant circulation going on, and all the phenomena of heat, light and gravity are produced as the result of this activity of force playing between the sun and earth. But where is the place of manifestation—all along the space, or at the sun, or is it at the earth? We find the field of encounter between the forces to be our atmosphere, and there it is where the collision takes place, and all the power and the heat and the light are generated. There is no reason why there should be outside of this space a similar activity; for being conditioned upon the three elements, sun, earth and atmosphere, we cannot look for heat, light and power except at places where the conditions are met. It thus appears that the exceeding brilliancy of the sun, instead of being a phenomenon located in the sun itself, really belongs to our atmosphere, and more especially to the lower strata of the same. As in the case with heat, so also with light. There is a rapid diminution of both as we ascend, so that beyond the lower portion of the atmospheric mass there is no dazzle and the human eye in looking upon the great orb from the greatest height attained by the aeronaut and mountaineer is not dazzled. All actual facts and all rational considerations lead to conclusion that the sun is not the manufacturing place and the distributing reservoir of actual heat and light, but that it is rather the source from whence the whole solar system is supplied with the invisible potential heat and light which become developed into such only where they are required. The sun may therefore be regarded as like unto the earth, viz., a dark, cool, habitable body. So far we have been pleased to assume that an electric current is moving incessantly from the sun to the earth and back again. But we hold that this hypothesis is capable of rational demonstration, and that, too, through several leading physical phenomena. The philosophy of the earth's rotation upon its axis favors that hypothesis.

The correlation and virtual identity of heat and

magnetism is demonstrated by certain natural phenomena which bear upon this point. The tropical plant, the *phytolacca electrica*, is known to produce marked electrical effects; a touch of a twig gives to the hand as vivid a shock as that of a Ruhmkorff battery. At the distance of twenty or thirty feet the influence of the plant is manifested through the compass needle, the closer the proximity the more marked are the demonstrations; and if the compass is placed in the center of the bush, the movement of attraction previously shown by the needle is changed into that of rapid rotation. The intensity of the phenomenon varies with the time of day. At two o'clock in the afternoon it attains its maximum, and at night its magnetic powers are scarcely perceptible. It is thus demonstrated that at precisely the same hour, viz.: two o'clock in the afternoon, heat intensity and magnetic intensity are co-incident. From this hour each diminishes. From the morning until two o'clock in the afternoon each increases in the same proportion. The hour of minimum magnetic effect, or the most negative condition, is shown by various phenomena to occur at a period of time opposite to its maximum or positive condition, viz.: Two o'clock A.M. From this and such like familiar suggestions on the part of nature we may infer that the portion of the earth which is at any given time specially under the action of the great sun-current becomes electro-positive, the maximum intensity occurring at two o'clock P.M. During the night the magnetic condition changes, and is at two o'clock A.M., most electro-negative. Thus at two o'clock P.M., the positive sun on the one hand and the positive earth at thirty degrees west meridian on the other hand, being in like electrical conditions, viz.: electro-positive, mutually repel each other, and this in accordance with the electrical law that likes repel, and the consequent push moves the earth in revolution. The revolving earth turning eastward is continually carrying its negative condition of the night into the field of the positive sun. A mutual attraction, therefore, takes place, with its consequent pull upon that side, according to the electrical law that unlikes attract. Thus is generated the process of an incessant attraction on the east side and of repulsion on the west side giving to the earth its axial motion.

I have thus endeavored to present before you in a simple and intelligible manner, my own theory of these great physical phenomena. I have endeavored to demonstrate the fact that the electric, or magnetic force, is generated by the same process—performs the same functions and produces the same results, whether on the grander scale of the celestial spheres, or on the smaller scale of the diminutive battery of man's construction.

The limited space of time allotted to a public lecture permits but little to be said upon the vast subject which forms our topic. It is, however, gratifying to believe that I may have to-night awakened thought, or excited interest, that in the future may, either directly or indirectly, lead to a fuller and clearer understanding of sun-heat and sun-light.

INTER-STELLAR SPACE.

IS SPACE A VACUUM, OR HAS ETHER A SUBSTANTIAL QUANTITY?

To the Editor of the Rochester Evening Express:

THE rational query of your correspondent places me under obligations to reply. He says:

"I have been taught that space is vacuum, and that vacuum is not a conductor of the electric current. If that is so, how is the current of electricity conducted through the vast vacuum between the

earth and the sun? I would be pleased to have Dr. Rogers explain through your columns."

An electrical inter communication between the earth and sun is demonstrated through various natural phenomena. The bright sun-burst, or sun-spot, simultaneously seen by different observers, produced instantaneous and violent electrical disturbance over portions of two continents. This is proof of electrical communication, and stands as a fact, independent of all methods and theories of explanation.

The basis of the undulatory theory of transmission of sun heat and sun-light is the identity of the action of water-waves and ether-waves. The undulatory theory owes its earliest conception and subsequent development to this fundamental idea.

The theory of an inter-stellar medium is objectionable in several different points: First, the element of resistance which it would offer to the current which it is claimed to bear—this is conceded. Second, that of wastefulness—which is antagonistic to "conservation,"—it necessitates a greater length of pathway and a consequent increase of the force of propulsion. Third, that of obstruction to the movement of the celestial spheres; the inconceivable velocities of which could only be possible in absolute vacuum.

Its advocates and exponents have found it indispensable to endue the ether of space with substantial qualities. Says its distinguished champion of to-day: "It is more a solid; more like jelly than ether." We are asked to believe that this luminiferous jelly fills all space; that it is capable of passing through the earth or solid walls of masonry with as perfect facility as the wind passes through a clump of trees. The inutility of the so-called luminiferous ether is shown by the fact that there is a well-known principle which is capable of performing every true function which is claimed for it. This principle passes through all forms and conditions of matter, solid, liquid and gaseous alike, and inter-penetrates them all. This principle is electricity. It is not wisdom, there ore, to accept the hypothetical and grossly irrational in place of the tried and true.

We are told by one of the best and most recent writers upon the subject of electricity, that "the electric forces are transmitted, not only across the best vacua we have as yet been able to produce artificially, but certainly also across the inter-planetary spaces."

The question whether space is vacuum, or whether it is filled with a tenuous medium called ether, finds its solution in the teachings of common phenomena, and in the demonstrations of actual experiment.

H. RAYMOND ROGERS.

Dunkirk, N. Y., March 21, 1882.

TELEGRAPHERS' AND WRITERS' CRAMPS.

THE following is a portion of a paper by Frank D. Willis, read before the Chicago Electrical College on March 20, 1882:

In order to determine the best means of avoiding or preventing the telegraphers' or writers' cramp, as it is erroneously termed, we should first inquire what is likely to produce it.

One of the most important factors is a predisposition or hereditary tendency to nerve disease. This may follow from a marked nervous temperament running through the families of either the father or mother; from the father having been a dissipated man, either as to liquor, tobacco, or in general dissipation of society, or in fact from dissipation even in his business or profession. We are prone to

point to our forefathers and mothers as perfect pictures of health, to say no men can now stand what they could, that the present generation, from its mode of life, is far inferior to previous generations in physical endurance. While I admire as much as any one can the sturdy, honest farmer or artisan of the past century, revere with as much sacredness as any one the noble specimens of mothers and housewives of the ages gone by, still the thought comes crowding, forcing its way in my mind, would we of this generation not be stronger, would we not have more physical—aye, even more moral—resistance had they taken more recreation and done less hard work; had they saved and transmitted some of their superabundant strength to us, instead of dissipating it in their daily avocations? And in this fast age what are we, as fathers and mothers, saving of what physical, mental and moral force we have for those who are to follow us on this stage? Are we preparing to leave them a legacy of resistance to disease, or to leave them a legacy of a strong predisposition to any ails to which they may by the force of circumstances become exposed?

If, perchance, you are born with a perfectly healthy, sound physical and nervous organization, you have escaped one of the causes which may lead to the disease under consideration; but now comes in another danger, the child should early be controlled, and thus be in condition to control himself, and in this way avoid a tendency to an acquired nervous disposition. The muscular system should be systematically and carefully developed. By this I do not mean that a child must become a thoroughly trained athlete, but that he must have a well developed and reasonably strong muscular system.

The nourishment of the child should not be neglected, for no matter how much training there may be, if poor air and poor food, or an insufficient quantity, be supplied, the growth and development will be materially interfered with. Having now considered the predisposing causes briefly for which we are not individually responsible, we can look for a moment at those for which we are directly responsible, or those which affect us, or are likely to after we arrive at an age of maturity. Now it is a well established fact that anything which tends to weaken the general physical force or health, which tends to debility in any way, will deprive us of a greater or less proportion of resistance to disease, and consequently make us more or less susceptible to disease. Among the many things which may cause this debility we find poorly ventilated homes, where the air we breathe becomes vitiated and loaded down with impurities which we have thrown off, as not only of no farther use to us, but as positively poisonous with gases from improperly constructed sewers, or imperfect traps connecting with the sewer, and from other sources. Now, much has, of late years, been written and said as to sewer gas and impure air being the cause of various diseases. It has, in fact, become quite fashionable to attribute everything for which we can not or do not care to take the trouble to find a direct cause to the sewer or improper ventilation. I do not intend to add this disease to the already overcrowded list of those which are thus caused, but I do claim that the system through the debilitating poisonous influence, from the nutrition as furnished by pure air being defective, is rendered less resistant and more susceptible to this as to many of the other diseases. The same way will be said and possibly urged with more force with relation to the thorough ventilation of the operating rooms, where so large a number of men and women are confined so many hours in the day.

The home should be cheerful and as free from worry as possible. Few are killed or made sick

from hard work, but many from worry. This element plays a much more direct part in the production of the special condition under consideration than the preceding, as it attacks more directly the nervous system. The question is at once asked how can we help worrying. If we are behind with our board, our rent or grocer or other tradesman, they will dun us, they will worry us until we are able to pay. Our salary is small, we have got behind and it seems utterly impossible to catch up. Well, in most instances, you should never have allowed yourself to get behind. No man or woman should, as a rule, run in debt for anything, if he does not he will never be behind. You say how can we help it. The man above you in position, who receives a large salary, will say the same thing, and I think if you can only realize that you are not only jeopardizing your happiness and peace of mind, but that you are rendering yourselves liable to disease, which will unfit you for earning anything, you will stop and consider well whether you can not for a smaller sum purchase, and pay for it, that which will answer your necessities just as well. The man who is already behind can only gradually get rid of his worry by being careful that his present expenses are a little less than his income, and by placing the surplus in the hands of his creditors, instead of later giving it to the doctor.

There is a class of people, however, to which trouble comes in the shape of sickness, of themselves or family in such manner as to render this worry impossible, and to add to it the anxiety occasioned by such sickness, to them we can only say, you have our fullest sympathy, and our best wishes that you may soon find your burdens lighter, or your salary heavier.

Stimulants of all kinds tend to weaken, while I can not say that there are no circumstances under which the use of stimulants may not only be of benefit, but necessary. I do say, and desire to impress it most firmly on your minds, that in health or in ordinary circumstances, even in most extraordinary cases, stimulants injure the nervous system. One of the most frequently used by telegraphers and also one of the most potent predisposing as well as often direct causes of this disease is tobacco. While it is a wild sedative stimulant, it is a very potent factor in the production of many forms of paralysis. I think nearly if not quite 75 per cent. of the cases which have presented been to me for treatment, have been in persons addicted to the excessive use of tobacco. Now do not understand me to say that all these cases even were produced directly by this plant, but when a young man presents himself, who has inherited no predisposing tendency, who has been under favorable circumstances in other respects for the retention of all his forces, who has been free from causes to worry him, and who has not been engaged in this calling a long time, in short, where on the closest investigation, I am unable to discover any adequate cause for the disease, and I learn that he is an excessive user of tobacco, and has been for a considerable time, knowing that it will sometimes produce such conditions in other muscles, I must conclude that it is the principle cause of this trouble.

Dissipation of other kinds, as the loss of the necessary amount of sleep, whether it be from extra study, or from too much society, are also potent influences in reducing the resisting powers of the system. Avoid excesses of all kinds, physical, mental or social.

Among the direct causes may be mentioned, uncomfortable positions during operation, the table may be too high, causing an unnatural position of the arm, the seat may be too high or too low. The key

(Continued on page 116.)

Journal of the Telegraph.

PUBLISHED MONTHLY, ON 20TH OF EACH MONTH, AT
195 BROADWAY.

THE JOURNAL is issued on the 20th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,700 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....\$ 1.50
One Copy, six months, postage included..... .75
Single Copies, 15 cents.

ADVERTISING RATES.

One inch space—each insertion.....\$ 2.00
Half inch " " 1.00
Quarter Column, " 4.00
Half " " 8.00
One " " 16.00

Outs charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, MAY 20, 1882.

TO MANAGERS OF OFFICES.

COPIES of the JOURNAL in good condition are wanted of April 20, 1882, No. 348. Please address them to Editor JOURNAL OF THE TELEGRAPH, New York City.

THE SUN AN ELECTRIC LIGHT.

Those who are familiar with the rays of the electric light are at once led to its analogy to the sun's rays. Astronomers and scientific observers of the solar system have been slow to attempt to trace this analogy since the first discovery of the power of the electric light and its generation by motion, but now there seems to be some earnest workers and thinkers in that direction. In our present issue will be found a thoughtful lecture by Dr. H. R. Rogers before the Academy of Science in Rochester, N. Y., in which he puts forth an argument which leads us to believe that probably the rays of the sun are purely electrical, or the same as those of the electric light. The generation of sun light and sun heat by the motion of the sun and of the earth in connection with the atmosphere that surrounds the earth may be on the same principle as the generation of the electric light. He says:

"Let the dynamo electric machine be to us an interpreter to translate the language of universal phenomena. It can be made to develop heat, light and power, while being itself neither hot, luminous nor magnetic. It may develop them not only in its immediate presence but in the next house, or in the next city. It suggests that the sun may be neither luminous nor hot, and yet do the same. It teaches that potential action generated in a dark, cool body may produce great heat, light and attraction, at a distance from the seat of activity; and what we can

work artificially in a small way may surely be done naturally, and in a tremendous fashion, by the grand forces of the sun.

"The object of resistance to the sun's current earthwards is our atmosphere, which supplies the necessary conditions represented by 'carbon point' and 'platinum coil' in practical electricity. A current, invisible, without manifestation passes through space as electricity through wires, until, meeting the resistance and favorable conditions of our atmosphere, there occur those wonderful and important phenomena, heat and light. No particle of either heat or light need, therefore, come as such from the sun to the earth, the current being wholly invisible and cold in its passage. The existence of such a current earthward is not doubted by any one, but the law of magnetic action, as well as the law of conservation of force, requires the recognition of a return current."

He then proceeds to prove that there is a return current also; this demonstrates his theory. It is truly a sublime idea, and the world is indebted to Dr. Rogers for the lucid manner in which he explains it in connection with well known phenomena. The present popular belief of scientists, that the supply of sunlight and sun heat is kept up by material bodies falling into the sun seems as primitive an idea and as commonplace as does a lighted candle or pine knot compared to the electric light of the present day, and almost as absurd as that "the moon is made of green cheese."

BOOK NOTICES.

Telegraphic Tales and Telegraphic History: A Popular Account of the Electric Telegraph; its Uses, Extent and Outgrowths By W. J. Johnston, Editor of "The Operator." Second edition. Revised and enlarged. 286 pages. Cloth. Tinted paper. New York: W. J. Johnston, Publisher, No. 9 Murray street.

The second edition of the above interesting and valuable work recently published, has been brought absolutely down to date, including an entire new chapter devoted to the late Paris Electrical Exhibition. Considerable fresh matter has also been added here, and there are in the other sixteen chapters, there being thirty-two more pages in the second edition than in the first. We understand that "Tales and History" has been the best selling of any of Mr. Johnston's publications—a fact which few who have the good fortune to read it will be likely to question. Most readers will probably feel like the editor to whom a copy was sent for review, and who sent back the following enthusiastic note to the author and publisher: "You will know what my opinion of the book is when I tell you that I glanced at it to see what it was like and did not stop till I read every word in it."

Practical Information for Telephonists: By T. D. Lockwood, Electrician American Bell Telephone Co. 192 pages. Cloth. New York: W. J. Johnston, Publisher, No. 9 Murray street.

This new work is a manual of convenient size and shape for ready reference by the telephonist, and will also be found of value to telegraphers and electricians as well. Its comprehensiveness appears in a review of its contents. It comprises a Historical Sketch of Electricity from the year 600 B. C. to 1882 A. D., chapters on the Early Days of Telephony, How to Build a Short Telegraph and Telephone Line, the Earth and its Relation to Tele-

phonic Systems, the Magneto Telephone, the Blake Transmitter, the Disturbances Experienced on Telephone Lines, the Telephone Switch-board, the Magneto Bell and how to become Acquainted with It, Telephone Transmitter Batteries, Lightning and its Actions on Telephone Apparatus, a series of chapters on the Telephone Inspector and His Work, a chapter on Individual Signals, Telephone Wires versus Electrical Light Wires, Anticipations of Great Discoveries and Inventions, and other subjects.

Candle Power of the Electric Light: By Paget Higge, L. L. D. Pages 18. E. & J. N. Spon. New York: 446 Broome street; London: 16 Charing Cross—1882.

This pamphlet is to accurately show the candle power of the various devices, affording the electric light. Many statements are constantly before the public on this point, and there was no ready means of ascertaining their correctness. It may now be ascertained how far they are correct, and comparisons are made in the various kinds of light.

FREDERICK E. SAWARD, editor of the *Coal Trade Journal*, of New York, has just issued his ninth annual review of the coal trade. The title of this most valuable little book is "The Coal Trade." It is a compendium of valuable information relative to coal production, prices, transportation, &c., at home and abroad, with many facts worthy of preservation for future reference, corrected to the latest dates.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.—ADV.

TELEGRAPHERS' AND WRITERS' CRAMPS.

(Continued from page 115.)

may be so placed on the table as to keep the hand and arm in extension, being too far back or to one or the other side.

You should always endeavor to see that these various minor details are attended to. You will frequently find that you can, by a very little ingenuity, make the height of your chair and table correspond, so that the arm while operating can hang easily and freely from the shoulder, so that, as the fore-arm rests on the table there is no special pressure and prevention of free circulation on the under side by the edge cutting into it. It is much better that you raise the body sufficiently to even prevent the arm resting flat on on the table than to be too low.

But under such circumstances you want also to see that the feet and legs do not hang in such a manner as to have the circulation in them impeded by the edge of the chair, this can be remedied by having a sort of foot-stool or low platform for the feet, being sure that it is large enough to allow freedom of motion, so that the legs do not have to remain in one position all day long.

In sitting at your table be careful not to fall into the lazy habit, so common, of throwing the shoulders forward. See that the clothing about the neck and shoulders is loose and easy, any garment that is too tight under the arm not only interferes with the circulation, but also presses directly on the large nerve trunk, or conducting cable, interfering with its freedom of function. I have seen several cases where the first symptoms were just beginning to show themselves, where almost instant relief was afforded by simply calling attention and having corrected some comparatively slight defect in the easy fit of the clothing, quite frequently the under-

shirt sleeve is too small, and there is a steady, slight to be sure, but even pressure over the entire arm, and quite a decided arrest of the circulation. I must mention here a very pernicious habit which I believe is quite common, that of wearing elastic bands around the arms to keep the shirt sleeves from coming down too low, or of wearing cuff protectors, with an elastic cord run in the top to hold them in place. Out your sleeves off, dispense with cuffs, turn up the sleeves, anything rather than to have any constriction of the circulation in the arm and making a hemisphere of your back, by throwing it into a convex curve, both along the spine and across the shoulders. This tires the muscles of the back, takes away from the general strength, also tires the muscles of the shoulder and arm, throws them out of their proper relation to each other, calling on the co-ordinating apparatus to make allowances for this abnormal relation, and to prevent the body from losing its equilibrium. It also constricts the chest, presses the lungs in a much smaller compass than natural, prevents the air cells from full expansion, and consequently, imperfect oxidation and renovation of the blood, and much debilitating and poisonous matter is retained in the system which should be thrown off.

The stomach and bowels are also restricted in their freedom, and that among the wisest of arrangements. The perfectly elastic cavity containing them is converted into a small, tucked up apartment, digestion and assimilation of food is interfered with, dyspepsia sets in, you become poorly nourished, and your resisting power is gone. Soon you begin to feel the first symptoms of this disease.

Having avoided all the predisposing and direct causes mentioned, you will find yourselves very much less liable to this disease, and that, while you may not escape it ultimately, yet it will be much later in your profession, and its advance will be much less rapid after the first appearance. But we still have to mention the most direct cause, that which determines or causes the weakened nervous system to show its abnormal action in this particular direction or location. It is now known that all persons following pursuits in which there is an excessive labor demanded on the part of the smaller muscles of the fingers, and continuous efforts of co-ordination required, are liable to some form of this disease: constant sewing, knitting, drawing, playing the organ, piano, violin or harp, engraving, setting type, milking, writing, etc., as well as telegraph operating, can show their cases, and claim recognition in naming of this disease.

The muscles most likely to be affected are those of the first and second fingers and possibly of the thumb. The little finger not unfrequently. Next in frequency, we find the muscles of the wrist and forearm, less frequently those of the arm and shoulder. Much can be done toward preventing this disease, by care in resting alternately different set of muscles, that is by learning different methods of handling the key, and using at one time one method at another, another method; by frequently, when waiting for an answer to a signal, or for the repeating of the whole or part of a message, removing the fingers from the key, opening the hand wide, and closing it in rapid succession two or three times, allowing the hand to drop down to the side of the body, raising it over the head, extending it, in fact, doing anything with the hand and arm that will call into play a new set of muscles. This need not interfere in the least with the busiest operator. You might get up and sit down again, even only once. Any of these trifling things take the attention from this one channel, allows the co-ordinating center in the brain to rest, and prevents it from becoming, as it were,

paralyzed. Remember it is not so much the amount of work done by these muscles in the day as it is the continuous steady strain in one position or on one section of the co-ordinating apparatus from its center to its terminus.

The first sign of this disease noticed is usually a disagreeable sensation of tension in the hand, felt only after using the key a considerable length of time, which immediately disappears, as soon as the hand is removed, and there is a change of relative positions of the fingers and arm. It may scarcely attract attention at first, but will grow more and more marked, and may be followed by a feeling of numbness, of excessive fatigue, of weakness. Now we are apt to have a little tremor or trembling show itself, and that it requires more close attention and a stronger effort to regulate the movements so as to produce the letters clearly and with the necessary rapidity, this may increase until the instant almost that we touch the key, there is a very marked and severe trembling, so that operating is impossible even by holding the wrist with the other hand.

Or we find that, either without any trembling or following its appearance very quickly, there is a gradual failure of the power to move the muscles necessary, and that as we try one device after another to operate by calling into play other muscles, they gradually one after the other fail, until the fingers and hand will simply lay lifeless and still on the key, utterly refusing to be lifted by the strongest effort of the will, or we may have following the trembling, a contraction of some one or more muscles, producing a spasm or cramp, which may be confined to the fingers or extend to the muscles of the arm. Any of these conditions may exist and you still be able to use the hand with perfect freedom in the performance of any of the ordinary coarser movements, these symptoms only showing themselves when you touch the key or undertake to do any similar work, such as writing, etc.

In other cases, however, we find general disturbance, that the special symptoms of the hand and arm are present all the time and when undertaking to do anything, that there are symptoms referable to other parts of the body, that there is a general prostration, etc.

After a case has become sufficiently developed to attract marked attention, it should be carefully studied, with special reference to the discovery of the exact location of the disease, as well as to the character of disease producing the symptoms. It should be determined whether there is disease in the brain, the spinal cord, in the nerves running from the cord to the affected parts, or in the muscles themselves. If it happen to be an ordinary case of uncomplicated telegraphers' cramp, tremor or paralysis, and not far advanced, absolute rest is the most efficacious of anything.

But many cases have occurred where this was supposed to be the case and long rest taken without any benefit, and afterward the discovery was made that it was only apparently this disease, and was in reality a much more serious one, and valuable time has been lost.

Now allow me to call your attention to the principal points, a good, strong, muscular and nervous organization and development, good nutrition as to food and air, proper clothing, the avoidance of dissipation, or anything likely to debilitate, and rest. If these things are neglected, the muscles of the hand and arm will be repeating to you a stanza from Shakespeare, and say:—

How can I, then, return in happy plight,
That am debarred the benefit of rest?
When day's depression is not eased by night,
But day by night, and night by day, oppressed.

And each, though enemies to either's reign,
Do in consent shake hands to torture me;
The one by toil, the other to comp'ain
How far I toil, still farther off from thee
I till the day, to please him, thou art bright
And dost him grace when clouds do blot the heaven;
So flatter I the swart complexioned night.
When sparkling stars twine not, thou glidest the even;
But day, doth daily draw my sorrows longer,
And night, doth nightly make grief's length seem stronger.

FROM THE BIRMINGHAM IRON AGE, JEFFERSON COUNTY.

Eight convicts arrived at New Castle Sunday last from Mobile. Among them was John J. Thomson, who was convicted of embezzlement, and sentenced to four years hard labor in the coal mines. He was the confidential clerk of the Superintendent of the Western Union Telegraph Company, and appropriated several thousand dollars of the company's funds to his own use and absconded. Detectives were put upon his track and followed him from Mobile to Mexico and then to Jersey City, where he was finally captured and brought back to Mobile for trial.

BORN, April 30th, to Dan'l O. Donohue, operator, of 195 Broadway, New York, a son.

ANYBODY knowing the whereabouts of Geo. W. Bloomfield, Railroad Agent and Operator, will confer a favor by sending such information to editor of this paper.

MR. ROBERT G. BROWN, formerly chief operator of the Metropolitan Telephone & Telegraph Company of this city, and now electrical engineer of the Societe Generale des Telephones, of Paris, France, has been elected a member of the Societe Industrielle et Commerciale, of Marseilles, France.

THE longest span of wire in the world is used for a telegraph in India, over the River Kistnah, between Bezorah and Sectanagrum. It is more than 6,000 feet long, and is stretched between two hills, each of which is 1,200 feet high.

PARTLY PREPAID LETTERS.

IMPORTANT ORDER OF THE POSTMASTER-GENERAL.

Postmaster-General Howe recently issued an important order, the operation of which will be of great benefit to mercantile classes in all the large cities of the country. It directs that after the 1st of July next all letters on which a full rate of postage has not been prepaid, instead of being forwarded to the Dead Letter office shall be held by the postmaster of all letter carrier or free delivery offices and the addressee informed by official postal card that it is only necessary to remit the postage due to receive the letter. It was ascertained that nearly one-half of the letters received at the Dead Letter office for lack of prepaid full rate were from cities where the letter carrier system is in operation. The new order will consequently make 111 Post Offices centres of distribution for matter now received at one centre—the Dead Letter office. To illustrate, the Postmaster at Baltimore tested the new regulation several months ago. Out of 1,300 letters that would have been sent to the Dead Letter office for lack of proper prepayment all but thirteen reached their destination without the circumlocution of the Dead Letter office. A full rate of postage is three cents. The class of letters referred to are those on which a two or one cent stamp has been affixed, or no postage stamp at all. The new order will enable the force employed in the Dead Letter office to give prompt attention to the business more properly belonging to it, and leave to the postmasters in large cities the duty of forwarding all mail matter that comes within the provisions of the new order of the Postmaster-General.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

P. O. Box 3175, New York.

ASSESSMENT No. 151—May 1, 1882.

FLY W. JOHNSON, died at McMinnville, Tenn., April 14, 1882, of Malarial Fever. His certificate, No. 2730, was issued August 19th, 1876.

One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4117.

Insurance expires May 31, 1882; Membership, June 30, 1882. The number of members of the Association in good standing is: 1st Division, 2209; 2nd division, 134.

ASSESSMENT 152.—May 21, 1882.

FREEMAN D. ADAMS died at Green Island, near Troy, N. Y., May 11, 1882, of Pneumonia. His certificate, No. 193, was issued December 19, 1867.

One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4135.

Insurance expires June 20, 1882; Membership July 20, 1882. The number of members of the Association in good standing is: 1st Division, 2214; 2nd Division, 135.

BY-LAWS—SECTION VII. "Upon the death of a member of the Association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and in case payment shall not be made within 30 days thereafter, the delinquent shall forfeit all claim to the benefits of the Association; and should payment not be made within 60 days, shall forfeit membership to which said delinquent can only be restored as provided in Section VII. of these By-Laws."

A. R. BREWER,

Secretary,

P. O. Box. 3175, New York

TRANSFER SERVICE.

EXECUTIVE OFFICE,

WESTERN UNION TELEGRAPH COMPANY,
New York, May 18, 1882.

To all Transfer Agents and Offices.

Mr. Chas. E. Page has been appointed Transfer Agent of this company, at Cincinnati, O.

The transfer service has been discontinued at the following named offices:

IN JAS. COMPTON'S DISTRICT:

Woodville, Miss.

IN CHAS. JAMESON'S DISTRICT:

Bordentown, Freehold, Rahway and Salem, N. J.

IN FRANK JAYNES' DISTRICT:

Antioch and Oroville, Cal., and Elko, Nev.

On May 15th, 1882, Defiance, O., was added to the list of transfer offices in Class B, and assigned to Chas. Catlin's district.

On June 1st, 1882, the following changes will take effect:

Gold Hill, Nev., in Frank Jayne's district will be reduced from Class A to Class B.

Richburg, N. Y., will be added to the list of transfer offices in Class B and assigned to C. O. Rowe's district.

Winnipeg, Manitoba, will be added to the list of transfer offices of the Great North Western Telegraph Company of Canada, in Class A, and all transfer orders for such office will be addressed to Mr Arthur Cox at Toronto, Ont.

NORVIN GREEN,

President.

WESTERN UNION HALF RATE FRANKS ON GREAT NORTHWESTERN TELEGRAPH MESSAGES.

WESTERN UNION TELEGRAPH Co.
New York, May 20, 1882.

In answer to inquiries from various offices in regard to the acceptance of Western Union half rate franks for messages to and from offices on the lines of the Great North Western Co., it should be stated for the information of all, that:

Holders of Western Union "Half Rate franks," who offer messages for places on the G. N. W. lines (to which Western Union offices have a check direct tariff), can be allowed a rebate only when the full rate tolls amount to over 50 cents, (equal to 25 cents for each company). When the tolls amount to between 50 cents and one dollar, one half shall be for the G. N. W. Co.; from the other half a rebate may be allowed, subject to the usual limitation, which provides that the W. Union tolls on a "half rate frank" message shall not be less than twenty-five cents. When the tolls amount to one dollar or over the amount of rebate allowed will be one-fourth of the full amount of tolls.

THOS. T. ECKERT,
General Manager.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, May 20, 1882.

To all offices on Western Union lines:

A notice on the Check Report blank No. 7, in reference to the arrangement of the names of offices thereon, is frequently disregarded or imperfectly observed by very many offices. Some of the reports have the names of the offices arranged by the first letter, or by the first and second letters only. This is not sufficient. The names should, as far as possible, be arranged as are the words in dictionaries or gazetteers.

The names of the States and Territories, which are frequently omitted, should always be given.

Messages to any of the Grand Rapids and Indiana Railroad offices named below, when offered by parties holding Western Union franks, must be charged at full rates from originating station to destination.

Avila, Berne, Briant, Fountain City, Geneva, Huntstown, La Grange, Lima, Lynn, Rome City, Swans and Wolcottville, in Indiana.

Ashton, Beitners, Belmont, Bradley, Boyne Falls, Cadillac, Cedar Springs, Crapo, Fife Lake, Harbor Springs, Kalkaska, Kingsley, G. T. Co. Leroy, O. Co. Lockwood, Mancelona, Mantou, Martin, Mendon, Moline, Monteth, Morley, Paris, Petoskey, Pierson, Rockford, Ross, Sand Lake, Shelbyville, South Boardman, Stanwood, Tustin, Walton, Wayland and Wetzell, in Michigan.

CHANGES.

The following changes which have been made since April 20, 1882, should be entered in the Tariff Book as they will not be republished.

ARIZONA.

* Florence, now 503 (30 2 N. M. rate) Casa Grande. Erase "† 251 Maricopa."

CALIFORNIA.

* Glenbrook, L. Co., reopened.
726 San Luis Rey, closed.
743 Santa Monica, reopened.
823 Stewart's Point, closed.

COLORADO.

* Mineral City should read * Mineral Point.
CONNECTICUT.
* So. Manchester should read 25 2 Hartford.

DAKOTA.

921 Ft. Randall, closed.
916 Greenwood, closed.

DELAWARE.

67 Slaughters, closed.

GEORGIA.

257 Hogansville, reopened.
257 Palmetto, reopened.

ILLINOIS.

299 Scotland, closed.

INDIANA.

281 Montclair, closed.
299 Raccoon, closed.

IOWA.

386 Bonair, closed.
455 Clark, Mills Co., closed.
463 East Orange, changed to 463 Alten.

KENTUCKY.

263 Cincinnati Junc. changed to 263 South Louisville.
* * Spring Sta. now W. U. of Square 243.

LOUISIANA.

414 Alexandria, now 424 Alexandria.

MAINE.

17 Wells Beach, should read 17 Wells. Erase "Summer office."

MASSACHUSETTS.

* Barre, now 10 1 by telegraph Barre Plains,

MEXICO.

* Lampazos, now 25 2 Laredo, Texas.
* Nuevo Laredo, now 15 1 Laredo, Texas.

MICHIGAN.

231 Woodstock P. O. is Kelley's Corners.

MINNESOTA.

885 Manston, reopened.

MISSOURI.

446 Oregon, closed.

NEBRASKA.

* Louisville, now W. Union office, square 474.
473 Pilger, closed.

NEW JERSEY.

41 Guttenburg, closed.

NEW YORK.

Erase ** Cemetery, on page 191 of Tariff Book.
56 Colton is in St. Lawrence Co.
40 Copake should read 40 Copake Iron Works.
41 Ft. Hamilton, reopened.
87 Holland Patent, closed.
46 Morriston changed to 46 Livingston Manor.
33 Ocean Point, reopened.

OHIO.

* Inland changed to * East Orwell.
181 Point Pleasant is in Guernsey Co.
213 South Fincastle, closed.
* Wellston, now W. Union office, square 213.

OREGON.

767 Grant's Pass should read 767 Grant's Sta.
805 Grant's Sta. should read 805 Grant's Pass.

PENNSYLVANIA.

59 Bridesburg, now * Bridesburg, 25 0 Frankford.
47 Hulmeville, closed.
111 North Branch, closed.
111 Rew City. Erase "P. O. care Bradford."
112 Stoytown, closed.

SOUTH CAROLINA.

136 Ridgeville, closed.
163 Whitakers, closed.

TENNESSEE.

* Dyersburg, now * Dyersburg, 40 3 Rives.
255 K smet changed to 255 Lansing.
785 McMinnville, reopened.
** Newbern, now * Newbern, 35 2 Rives.

TEXAS.

655 Aroya, closed.
* Cleburne, now W. Union office, square 649.
* Griffin, closed.

650 Parker changed to 650 Aledo.
655 Quito, closed.

VIRGINIA.

124 Scottsburg, closed.

WISCONSIN.

306 Bay View, Milwaukee Co., now ** Bay View, M. Co., 15 0 Milwaukee.
360 De Soto, closed.

ATLANTIC CABLE.

Until further notice, the rate from London to China, except Amoy, Hong Kong, and Shanghai, will be two dollars and thirty five cents per word. The rate to Amoy, Hong Kong, and Shanghai remains unchanged.

Communication through the cables from:

Amoy to Shanghai,
Shanghai to Nagasaki,
Mozambique to Zanzibar,
Pernambuco to Maranham and
Maranhm to Para

has been restored.

New telegraph stations have been opened at Nankin, in China, and at Fortaliza, in Brazil, South America. The rate per word from London to Nankin, is two thirty-five, and to Fortaliza, two seventy-five. Fortaliza is a station on the Brazilian coast between Pernambuco and Maranhm. The Siberian lines are repaired.

We have been informed that the cables of the American Telegraph and Cable Company have been opened for business. The rates for cable messages by this route are given in the following schedule of rates, to take effect May 22, 1882:

ATLANTIC CABLE.

CHANGE IN RATES TO GREAT BRITAIN, IRELAND, FRANCE AND GERMANY.

On and after Monday, May 22, 1882, the cable rate per word to Great Britain, Ireland and France will be twenty-five cents more than the rates printed on page 344 of the Tariff Book. To Germany the rate via the Anglo-American Co., will be the same as to France, and unless otherwise directed, German messages will be forwarded "via Anglo." When otherwise directed by the sender German messages will be forwarded "via Direct," "via French" or "via Canso" (the route of the new American Telegraph and Cable Co.), at an additional charge of nine cents per word. In such cases the route must be indicated by the words "via Direct," "via Canso" or "via French," which words should be given in the check, but will not be charged for.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in three columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

| | | |
|---|----------------|-----------------|
| 318 Akron. | 323 Cuba. | 324 Prichards. |
| 285 Bangor. | 323 Epsa. | 266 Stock Mill. |
| 294 Calera. | 293 Falkville. | 267 Notasulga. |
| * Alexander City, 40 3 (25 1 N. M. rate) Opelika. | | |
| * Dadeville 40 3 (25 1 N. M. rate) Opelika. | | |
| * Ft Morgan, 75 5 Mobile. | | |
| * Gainesville, 25 2 Epsa. | | |
| * Point Clear, 50 8 Mobile. | | |

ARIZONA.

| | | |
|---|----------------|--------------|
| 639 Bowie Station. | 644 Gila Bend. | 659 Winslow. |
| 690 Canon Diablo. | 659 Holbrook. | |
| 641 Contention. | 645 Sentinel. | |
| * Pinal, 50 4 (30 2 N. M. rate) Casa Grande. | | |
| * Silver King 50 4 (30 2 N. M. rate) Casa Grande. | | |

ARKANSAS.

| | | |
|----------------|------------------|----------------|
| 449 Brentwood. | 391 Jacksonport. | 449 West Fork. |
| 371 Knobel. | 401 Russell. | 449 Winslow. |

CALIFORNIA.

| | | |
|--|---------------------|----------------------|
| 800 Alameda Point. | 799 Norman Station. | 713 Volcano Springs. |
| Ok. Alameda. | 800 Ocean View. | 827 Whitesboro. |
| 827 Albion Mills. | 720 San Geronimo. | |
| 800 Decoto. | 826 Table Bluff. | |
| * Bidwell's Bridge, 25 2 by telephone, Greenville. | | |
| * Fall Brook, 40 3 San Diego. | | |
| * Lafayette, 15 2 by telephone, Martinez. | | |
| * Leesville, 50 3 Colusa. | | |
| * National City, 25 2 San Diego. | | |
| * Walnut Creek, 15 2 by telephone, Martinez. | | |

COLORADO.

| | | |
|---|------------------|-------------------|
| 546 Agate. | 545 Hardin. | 560 Pinon. |
| 565 Boreas. | 590 Hollys. | 567 Red Cliff. |
| 623 Browns Canon. | 599 Hortense. | 634 Rockwood. |
| 540 Buffalo, Weld Co. | 623 Hot Springs. | 628 Sargents. |
| 628 Calumet. | 634 Ignacio. | 536 Sedgwick. |
| 552 Carr. | 540 Huff. | 545 Snyder. |
| 540 Crook. | 552 La Salle. | 558 South Pueblo. |
| 545 Deusa. | 558 Oak Creek. | Ok. Pueblo. |
| 559 Earle. | 545 Orchard. | 599 Tennessee. |
| 541 First View. | 557 Pine Grove. | 592 Timpas. |
| * Akron, (N. M.) 65 4 Plattamouth. | | |
| * Alons 25 1 Gunnison. | | |
| * Bonanza (N. M.) 25 2 Villa Grove. | | |
| * Conejos, 25 0 Antonito. | | |
| * Eckley (N. M.) 60 4 Plattamouth, Neb. | | |
| * Hyde, (N. M.) 60 4 Plattamouth, Neb. | | |
| * Hook Springs (N. M.) 65 4 Plattamouth, Neb. | | |

CONNECTICUT.

| | | |
|--|----------------|----------------|
| 25 Goshen. | 37 Sandy Hook. | 29 South Lyme. |
| 25 Hop River. | 37 Southford. | 37 Steppney. |
| 25 No. Windham. | 37 Southbury. | 25 Thompsons. |
| * Bridgewater, 20 0 by telephone, New Milford. | | |
| * Naubuc, 30 3 Hartford. | | |
| * Noroton, 10 0 by telephone, Stamford. | | |
| * Warren, 20 0 by telephone, New Milford. | | |
| * Whitneyville, 50 0 New Haven. | | |
| * Winnipauk, 10 0 by telephone, Norwalk. | | |

DAKOTA.

| | | |
|---|----------------|--------------------|
| 884 Big Stone City. | 890 Gardner. | 898 Montrose. |
| 940 Canning. | 890 Hillsboro. | 920 Northville. |
| 918 Chamberlain. | 926 Hitchcock. | 915 Ordway. |
| 947 Dickinson. | 947 Houston. | 903 Preston. |
| 938 Eagles Nest. | 896 Kindred. | 924 Steele Sta. |
| 913 Eldridge. | 895 Mayville. | 947 Sully Springs. |
| 908 Ellendale. | 926 Miller. | 930 Wessington. |
| * Crook City, 50 2 by telephone, Deadwood. | | |
| * Colman, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Dell Rapids, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Egan, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Fort Rice, 25 1 Webster. | | |
| * Howard, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Madison, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn. | | |
| * Pine Ridge Agency, 150 9 Cheyenne, Wy. | | |
| * Poplar River, 25 1 Bismarck. | | |

* Rosebud Agency, 175 10 Cheyenne, Wy.
 * Spear Fish, 50 3 by telephone, Deadwood.
 * Sturgis City, 30 2 by telephone, Deadwood.
 * Wentworth, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.

DELAWARE.

| | | |
|-------------|-------------|-------------|
| 67 Hartley. | 67 Klamend. | 67 Porters. |
|-------------|-------------|-------------|

FLORIDA.

- * Blue Pond, 75 5, (50 3 N. M. rate) Lake City
- * Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
- * Highland, 50 4 Lake City
- * Kissimmee (N. M.), 150 10 Lake City.
- * Lochlie Sta. 75 5 (50 3 N. M. rate) Lake City.
- * Micanopy 75 5 (50 3 N. M. rate) Lake City.
- * Paola, (N. M.), 100 6 Lake City.
- * Perry Junction, 75 5, (50 3 N. M. rate) Lake City
- * Toocool, (N. M.), 50 3, Lake City.
- * Waits Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

| | | |
|---------------------------------------|--------------------|---------------------|
| 307 Dubois. | 176 Johnston. | 246 Roswell. |
| 246 East Point. | 226 Lawrenceville. | 226 Suwanee. |
| 187 Folkston. | 186 Perkins June. | 187 Victoria Mills. |
| * Abbeville (N. M.), 40 3 Ft. Gaines. | | |
| * Arlington, 40 3 Ft. Gaines. | | |
| * Blakely, 40 3 Ft. Gaines. | | |
| * Cedartown, 40 3 Cartersville. | | |
| * Senola, (N. M.), 25 2 Newnan. | | |

IDAHO.

| | | |
|---------------|--------------|-----------------|
| 575 Arimo. | 970 Bathrum. | 970 Sand Point. |
| 970 Dry Lake. | | |

ILLINOIS.

| | | |
|---------------------|---------------------|-----------------------|
| 516 Algonquin. | 336 Duggan, Ok. | Ke-347 Oakford. |
| 800 Alendale. | vaunce. | 358 Palmyra. |
| 807 Alpine. | 368 Epperson, Ok. | 316 Richmond. |
| 536 Annawan. | Bushnell. | 309 St. Maria. |
| 528 Beecher City. | 307 Dummer. | 299 Sidell. |
| Elmhurst Co. | 346 Forrester June. | 318 Stockton. |
| 329 Belknap. | 318 Gays. | 346 Union Grove. |
| 298 Bonfield. | 318 Hazel Dell. | 348 Wann. |
| 299 Boston. | 308 Henderson. | 309 West Liberty. |
| 337 Breckenridge. | 357 Knox, Ok. | Galva, 318 Westfield. |
| 336 Bureau, Ok. | 307 Mannheim. | 299 Wetzal. |
| Princeton. | 309 Monroe, Elmg. | 358 Wright, Ok. |
| 553 Chesterfield. | ham Co. | Greenfield. |
| 336 County Line Ok. | 326 Nachusa. | |
| Kewanee. | 307 New Lebanon. | |

INDIANA.

| | | |
|--|-------------------|----------------------|
| 252 Briant. | 253 Letts Corner. | 290 Paxton. |
| 300 Cynthiana. | 298 Lowell. | 298 Rose Lawn. |
| 252 Daleville. | 241 Maples. | 253 ka. dinia Cross- |
| 280 English Lake. | 262 Miroy. | ing. |
| 299 Fountain, Vigo | 280 Monon. | 271 Sedalia. |
| Co. | 300 New Harmony. | 253 Westport. |
| 270 Grangers. | 300 Owensville. | |
| 300 Ingles. | 261 Oasian. | |
| * Ferdinand. By mail, Ferdinand Station. | | |
| * Illiana, free, by telephone, Dana. | | |
| * St. Meinrad. By mail, Ferdinand Station. | | |

IOWA.

| | | |
|-----------------------|--------------------|-----------------------|
| 463 Alton. | 416 Harcourt. | 463 Remsen. |
| 463 Angus. | 416 Hawlock. | 416 Benwick. |
| 897 Ashton. | 435 Henderson, Ok. | 346 Riggs, Ok. Pres- |
| 426 Bancroft. | Hastings. | ton. |
| 417 Bethany June. | 426 Herndon. | 425 Rubens. |
| Ok. Lamoni. | 425 Irvington. | 426 Rutland. |
| 425 Bradgate. | 416 Kamrar. | 473 Salk. |
| 546 Browns, Ok. Pres- | 445 Irwin. | 367 Sand Spring, Ok. |
| ton. | 435 Kallio. | Anamosa. |
| 387 Buffalo. | 445 Kirkman. | 444 Sioux Rapids. |
| 425 Burr. | 388 La Crosse, Ok. | 455 Solomon. |
| 426 Clive. | Hamill. | 455 Stannett, Ok. Red |
| 426 Cooper. | 435 Lake City. | Ok. |
| 426 Dakota City. | 407 Laurel. | 416 Thor. |
| 367 Donahue, Ok. | 444 Laurens. | 416 Thrall. |
| Dixon. | 397 Libertyville. | 447 Van Cleave. |
| 367 Fairport. | 435 Lohrville. | 417 Van Wert. |
| 435 Farnhamville. | 444 Marathon. | 367 Viola, Ok. Stone |
| 454 Fletcher. | 367 Montpelier. | City. |
| 416 Galt. | 455 North Boro. | 426 West Bend. |
| 407 Girard. | 416 Pilot Mound. | |
| 426 Hardy. | 417 Polo. | |

KANSAS.

| | | |
|--|---------------------|--------------------|
| 517 Alum Creek. | 514 Galva. | 476 North Topeka, |
| 456 Argentine. | 507 Haselton. | Ok. Topeka. |
| 456 Barclay. | 508 Horton. | 508 Strong City. |
| 521 Chase. | 527 Lenora. | 518 Valley Center. |
| 527 Cleveland. | 507 Leonard. | 475 Wakarusa. |
| 517 Clifton. | 443 Mulberry Grove. | 466 Westphalia. |
| 527 Colyer. | 456 North Lawrence | Ok. Lawrence. |
| 503 Crawford. | | |
| 527 Edmond. | | |
| * Cottonwood Falls, 50 0 Strong City. | | |
| * Enterprise, 15 0, by telephone, Detroit. | | |

KENTUCKY.

| | | |
|--|-----------------|----------------------|
| 263 Bloomfield. | 253 Glencoe. | 263 South Louisville |
| 263 Crescent Hill. | 243 Pine Hill. | 263 Taylorsville. |
| 263 Finchville. | 263 Rocky Hill. | 339 Wickliffe. |
| * Clay Lick, 25 1 by telephone, Worthville. | | |
| * Coombs, Ferry, 25 2 Lexington, Ky., or 45 3 Hunting- | | |
| ton, W. Va. | | |
| * Eastern June, 50 3 Lexington, Ky., or 35 2 Hunting- | | |
| ton, W. Va. | | |
| * East Ky. June, 35 2 Huntington, W. Va. | | |
| * Flemingsburg, 15 2 by telephone, Johnson June. | | |
| * Gistville, 25 1 by telephone, Worthville. | | |
| * Grata, 25 1 by telephone, Worthville. | | |
| * Kilgore, 30 2 Huntington, W. Va. | | |
| * Lockport, 25 1 by telephone, Worthville. | | |
| * Marion, 15 1 by telephone, Worthville. | | |
| * Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, | | |
| W. Va. | | |

* Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. Va.
 * Peach Orchard, 25 2 Catlettsburg.
 * Pine Grove, 50 3 Huntington, W. Va.
 * Port Rime, 25 1 by telephone, Worthville.
 * Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
 * Springport, 20 1 by telephone, Worthville.

LOUISIANA.

| | | |
|--|--------------------|------------------|
| 424 Boyce. | 424 Leompte. | 433 Robeline. |
| 424 Boia. | 424 Mermontean. | 442 San Patrice. |
| 424 Garland. | 433 Moreland. | 433 Sinnott. |
| 442 Gloster. | 442 Pleasant Hill. | 442 Stonewall. |
| 442 Grand Cane. | 433 Provencal. | 424 Whiteville. |
| 354 Lookout. | 433 Prudhomme. | |
| * Atchafalaya Crossing, 50 3 (30 2 N. M. rate), New Orleans. | | |
| * Baton Rouge June, 0 3 (30 2 N. M. rate), New Orleans. | | |
| * Fodoohe, 50 3 (30 2 N. M. rate), New Orleans. | | |
| * Gouldsboro, 50 3 (30 2 N. M. rate), New Orleans. | | |
| * Gross Tate, 50 3 (30 2 N. M. rate), New Orleans. | | |
| * Plaquemine, 50 3 (30 2 N. M. rate), New Orleans. | | |
| * St. James, 50 3 (30 2 N. M. rate), New Orleans. | | |
| * Vacherie, 50 3 (30 2 N. M. rate), New Orleans. | | |
| * W. Baton Rouge, 50 3 (30 2 N. M. rate), New Orleans. | | |

MAINE.

4 Presque Isle.

MANITOBA.

| | | |
|------------|------------------|-------------------|
| Austin. | Portage La Prad- | Sewell. |
| Brandon. | rie Sta. | St. Boniface June |
| Dawton. | Reaburn. | Westbourne. |
| Gladstone. | Rosser. | West Lynne. |

The above named offices in Manitoba should be checked direct at the Manitoba State rate.

MARYLAND.

| | | |
|--|---------------------|------------------|
| 85 Ashland. | 77 Marlboro. | 54 Pocomoke Sta- |
| 77 Bowie. | 67 Octorora. | tion Ok. Poko- |
| 67 Edgewood. | 85 Odenton. | moke City. |
| 85 Lutherville. | 54 Peninsular June. | |
| * Gaithersburg, 25 2 Baltimore. | | |
| * Hyattsville, 25 2 Baltimore, Md., or Washington, D. C. | | |

Charge for three extra words in messages to Gaithersburg and Hyattsville, and accept only prepaid day messages.

MASSACHUSETTS.

| | | |
|--|---------------------|--------------------|
| 36 Conway. | 21 Wellesley Hills. | 12 W. Harwich, Ok. |
| 25 Oxford. | Dennisport. | Dennisport. |
| * Asylum Sta., 75 0 Danvers. | | |
| * Bass River Harbor, free by telephone, So. Dennis. | | |
| * Cochesett, 25 0 by telephone, East Bridgewater. | | |
| * Collins' Mills, Dracut, 15 1 by telephone, Lowell. | | |
| * Danvers Centre, 25 0 Danvers. | | |
| * Danvers Insane Hospital, free by telephone, Salem. | | |
| * Danversport, 25 0 Danvers. | | |
| * Dracut Navy Yard, 15 1 by telephone, Lowell. | | |
| * Forge Village, 15 1 by telephone, Lowell. | | |
| * Gardner, 15 0 Gardner Depot. | | |
| * Graniteville, 15 1 by telephone, Lowell. | | |
| * Hyannisport, 15 0 by telephone Hyannis. | | |
| * Lunenburg, 10 0 by telephone, Fitchburg. | | |
| * Matfield, 50 0 East Bridgewater. | | |
| * Melrose Highlands, 25 0 Melrose. | | |
| * Middlesex Village, 15 1 by telephone, Lowell. | | |
| * No. Middleboro, 150 0 Middleboro. | | |
| * Phenix Village, Tewksbury, 15 1 by telephone, Lowell. | | |
| * Rock, 150 0 Middleboro. | | |
| * South Billerica, 15 1 by telephone, Lowell. | | |
| * So. Gardner, 15 0 Gardner Depot. | | |
| * South Mills, 10 0 by telephone, New Bedford. | | |
| * Weentham, 35 0 by telephone, Providence, R. I. | | |
| * West Bridgewater, 15 0 by telephone, East Bridgewater. | | |
| * W. Chelmsford, 15 1 by telephone, Lowell. | | |
| * W. Danvers, 150 0 Danvers. | | |
| * Westford, 25 0, Westford Depot. | | |
| * Westford Depot, 15 1 by telephone, Lowell. | | |
| * West Gardner, 15 0 Gardner Depot. | | |

MEXICO.

* La Jarita, 25 2 Laredo, Texas.
 * Paso del Norte, 50 0 El Paso, Tex.
 * Parral de Hidalgo, 450 45 Brownsville, Texas.
 * Rodriguez, 25 2 Laredo, Texas.

MICHIGAN.

| | | |
|---|--------------------|--------------------|
| 188 Beaver Lake. | 137 Hobart. | 231 North Morenci. |
| 220 Beach. | 127 Indian River. | 250 Orleans. |
| 231 Bridge water. | 231 Jeroma. | 270 Penn. |
| 211 Britton. | 119 Manistee June. | 260 Ransom. |
| 210 Brookway Centre. | 210 Marlette. | 200 Ransome. |
| 250 Orapo. | 210 Mayville. | 26. Shabysville. |
| 210 Fostoria. | 260 Moine. | 137 Topinabee. |
| 127 Freedom. | 127 Mullet Lake. | 127 Vanderbilt. |
| 119 Free Soil. | 233 Narenta. | 100 Wetsell. |
| 230 Garfield. | 231 North Fayette. | 127 Wolverine. |
| * Flushing, 15 0 by telephone, Flint. | | |
| * Monising, 40 3 (30 2 N. M. rate), Marquette. | | |
| * Newberry, 40 3 (30 2 N. M. rate) Marquette. | | |
| * Palma, 4. 3 (30 2 N. M. rate) Marquette. | | |
| * St. Ignace, 40 3 (30 2 N. M. rate) Marquette. | | |
| * Seney, 40 3 (30 2 N. M. rate) Marquette. | | |

MINNESOTA.

| | | |
|--|-----------------------|--------------------|
| 190 Argyle. | 857 Mission Creek. | 892 Slayton |
| 865 Arlington. | 890 Muskoda. | 820 Sturgeon Lake. |
| 875 Buffalo Lake. | 883 Northcote. | 876 Vernon Centre. |
| 870 Green Isle. | 870 Oshawa. | 865 Waconia. |
| 889 Kennedy. | 869 Rock Island Quar. | 865 Winthrop. |
| 861 Minnehaha. | ry. | |
| 865 Minnetonka. | | |
| * Orris, 25 2 Tracy. | | |
| * Deforest, 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis., or 35 2, Sioux Falls, Dak. | | |
| * Prairie June, 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis., or 35 2 Sioux Falls, Dak. | | |

MISSISSIPPI.

| | | |
|----------------|----------------|-------------|
| 363 Armistead. | 351 Courtland. | 363 Morton. |
|----------------|----------------|-------------|

- * Arcola, 85 6 Vicksburg.
- * Johnsonville, 85 6 Vicksburg.
- * Stoneville, 85 6 Vicksburg.

MISSOURI.

- 457 Ellis. 388 Knox. 437 Napoleon.
- 369 Eliah. 427 Lake City. 427 Samsel.
- 427 Gault. 340 Lakeville. 398 Shelbyville. Ch.
- 369 Gilmore. 428 Montserrat. Shelby.
- * Ashley, 10 0, by telephone, Bowling Green.
- * Augusta, By mail, Ladelle.
- * Greenfield, 50 0 So. Greenfield.
- * Lemons 25 2, Unionville.
- * Pardin, 25 2 Unionville.

MONTANA.

- 958 Forsythe. 956 Keith. 583 Silver Bow Juno.
- 957 Iron Butte. 583 Melrose. 957 Terry.

NEBRASKA.

- 474 Adams. 464 Gilmore. 464 Springfield.
- 977 Atkinson. 27 Inman. 465 Stella.
- 474 Avoca. 922 Long Pine. 474 Talmage.
- 474 Brock. 464 Missouri Pacific. 927 Stuart.
- 538 Chappell. 465 Verdun.
- 922 Clear Water. 474 Sheridan. 474 Weeping Water.
- * Benkleman, (N. M.) 60 4 Plattsmouth.
- * Burchard, (N. M.) 35 2 Plattsmouth.
- * Haigler, (N. M.) 60 4 Plattsmouth.
- * Liberty, (N. M.) 35 2 Plattsmouth.
- * Stratton, (N. M.) 55 4 Plattsmouth.

NEVADA.

- 677 Junction. 676 Luning. 676 Soda Springs.

NEW BRUNSWICK.

- 3 Albert. 3 Lake Ha Ha. 3 St. Louis.
- 3 Carleton Sta.
- * Port Elgin, 25 2, Sackville.

NEW HAMPSHIRE.

- 20 Livermore.
- * Chesterfield, 25 0 by telephone, Brattleboro, Vt.
- * Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
- * North Hinsdale, 20 0 by telephone, Brattleboro, Vt.

NEW JERSEY.

- 41 Brick Church. 47 Clementon. 47 Magnolia.
- Tariff same as 41 Franklin (Essex Mills). 52 Valley.
- 53 Cedar Brook. 41 Iselin. 41 Wayne.
- 41 Centerville, Passaic Co. 47 Kingston. 41 West Orange.

NEW MEXICO.

- 559 Blossburg. 637 Gallup. 630 San Antonio.
- 556 Cerrillos. 560 Hot Springs. 638 Separ.
- 637 Coolidge. 638 Lava. 639 Stein's Pass.
- 559 Dillon. 626 La Jeya. 636 Upham.
- 828 Fort Selden, Ch. 632 Monero.
- * Fort Stanton, 25 3 San Marcial.
- * Fort Union, 25 2, Watrous.
- * Ojo Caliente, 50 0 Barranca.

NEW YORK.

- 64 A lion Station, 33 Great Neck, L. I.
- Owego Co. Ok. 191 Halbert. 41 North Tarrytown.
- and Bank. 40 Hensonville. 83 North Lansing.
- 65 Aps. chln. 58 Jeffersonville. 61 Rockland.
- 33 Broad Channel. 66 Keeneville. 41 Tarrytown Sta.
- Rockaway Beach. 46 Livingston Man- 44 Trembly's Iron
- Summer-office, or, 65 Works.
- b'k R. Beach. 3 Lowmanville. 46 Vestal.
- 111 Ceres. 8 Mannville. 46 Walkill.
- 46 Corn wall on Hud- 64 McConnellsville. 37 West Patterson.
- son. 74 Millers Saranac. 74 West Vienna.
- 74 Fish Creek. 44 Lake House. 46 Wicopee Juno.
- 51 Ft. h's Eddy, Del- 83 Nichols.

- * Bath-on-the-Hudson, 25 0 Albany
- * Brushland, 25 2, Delhi.
- * Kenwood, 25 0 Albany.
- * Minisink, Orange Co., 15 1 Port Jervis.

NORTH CAROLINA.

- 205 Alexanders. 205 Marshall. 194 Warm Springs.
- 125 Laurel Hill. 178 Newton. 98 Whiteville.
- 134 Jamestown. 144 Bowman Mills.
- * Falkland, 25 2 (25 1 N. M. rate), Tarboro.
- * Pactolus, 40 3 (30 2 N. M. rate), Tarboro.

NOVA SCOTIA.

- 2 Albion Mines. 2 Sherbrooke.
- * Baddeck, 25 2 North Sydney.
- * Ingonish, 25 2 North Sydney.

OHIO.

- 221 Alvada. 202 Longtreth Sta. 242 Osgood Sta.
- 231 Alvorston. 221 Luckey. 262 St. Johns.
- 170 Barton. 221 McComb. 159 S. rasburg, Stark
- 151 Brilliant. 221 McClure. Co
- 180 Oreston. 180 New Berlin, Stark 212 Storms.
- 232 Enterprise. Co. 213 Wheelersburg.
- 180 Everett, Summit 213 Newport. 180 West View.
- Co. 192 Point Pleasant, 232 Westville.
- 180 Fair Grounds. Gallia Co. 232 Yorkshire.
- 202 Halden Junction 159 North Benton.
- * De Kalb, 25 2 Mansfield.
- * East Orwell, (N. M.) 25 2 Ashtabula.
- * Hartville, 15 1 Minerva.
- * Hayville, Ashland Co. 15 1 by telephone, Ashland.
- * Jeromeville, 15 1 by telephone, Ashland.
- * Middle Branch, 15 1 Minerva.
- * Mogadore, 15 1 Minerva.
- * Monroe Centre, 20 3 No. Kingsville.
- * New Hazelton, 15 1 Minerva.
- * Osnaburg, 15 1 Minerva.
- * Pierpont, 25 2 No. Kingsville.
- * Poland, face by telephone, Youngstown.
- * Red Lion, 15 1 by telephone, Franklin.
- * Robertsville, 15 1 Minerva.
- * Sherrodsville, 15 1 Minerva.

OREGON.

- 785 Cascade Incline. 803 Hillsboro. 795 Whites.
- * Airle (N. M.) 50 3 Portland.
- * Blue Mountain, 50 5 by telephone, Walla Walla, W. T.
- * Fort Klamath, 50 3 Ashland.

PENNSYLVANIA.

- 64 Antes Fort. 94 Lewistown Juno. 151 South Side Pitts-
- 59 Berwyn. 140 Lucinda Station. burg. Tariff
- 130 Clarendon Depot. 59 Lukens, Ch. Nor- same as Pitts-
- 66 Conyngham. rington. burg. Ch.
- 82 Cresco, Monroe 84 Mainville. Pittsburgh.
- Co. 84 Mountain Grove. 131 Stonerville.
- 58 Dunmore, Ch. 140 Neshannock Falls. 140 Stratonville.
- Seranton. 59 Kahn's, Ch. Col. 130 Thompsons, War-
- 59 East Greenville. legevile. ren Co.
- 123 Elk Lick. 140 Rimersburg. 150 Union City Depot
- 151 Etna, Allegheny 76 Highland, Ch. 59 Virginville, Ch.
- Co. Sheridan Leb- Moselem.
- anon Co. 140 Volant.
- 140 Evansburg, But- 58 Rowland's. 150 Waterford Depot.
- ler Co. 94 St. Thomas. 130 Warren Depot.
- 151 Fallston. 11 Scabonda. 84 W. Milton Ch.
- 84 Georgetown. 159 Shelby Tariff Montgomery.
- 59 Gibraltar, Ch. Birdsboro. same as Qua- 151 Wildwood.
- 59 Glen Moore. kerton, Ch. 151 Wilkinsburg.
- 59 Honey Brook. Quakertown. 75 Williamsburg.
- 66 Hunlock's (open 130 Sheffield Depot. 151 Willow Grove,
- June 1). 159 Slippery Rock. Allegheny Co.
- 94 Hunter's Run. 84 Snyderstown. 140 Wilmington.
- 140 Jackson Centre. 111 Songbird. 140 Zellenople.
- 93 Jackson Summit 140 S. & A. Junction
- 131 June Bug. Ch. Mercer.

- * Academy Corners, 10 1 by telephone, Lawrenceville.
- * Alms House, 10 1 Allentown.
- * Balliettsville, 10 1 Allentown.
- * Best Sta, 10 1 Allentown.
- * Centre Point, 10 1 Allentown.
- * Centerville, Elk Co., free, by telephone, Scabonda.
- * Churchville Berks Co., 10 1 Allentown.
- * Clayton, 10 1 Allentown.
- * Corning, 10 1 Allentown.
- * Cowanesque Valley, 20 1 by telephone, Lawrenceville.
- * Dillingersville, 10 1 Allentown.
- * Elmer, 20 1 by telephone, Lawrenceville.
- * Eagleville, 10 1 Allentown.
- * Fairview, Montgomery Co., 10 1 Allentown.
- * Fagleyville, 10 1 Allentown.
- * Franklin, Lehigh Co. 10 1 Allentown.
- * Gilbertsville, 10 1 Allentown.
- * Harrison Valley, 20 1 by telephone, Lawrenceville.
- * Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.

- * Ironton, 10 1 Allentown.
- * Limerick Square, 10 1 Allentown.
- * Lower Milford, 10 1 Allentown.
- * Neffs, 10 1 Allentown.
- * Nelson, 10 1 by telephone, Lawrenceville.
- * New Berlin, 10 1 Allentown.
- * Overbrook, free by telephone, Merion Sta., Mont'g Co.
- * Pleasant Corner, 10 1 Allentown.
- * Red Hill, 10 1 Allentown.
- * Rucheville, 10 1 Allentown.
- * Saegersville, 10 1 Allentown.
- * Schnecksville, 10 1 Allentown.
- * Statedale, 10 1 Allentown.
- * Trappe, 10 1 Allentown.
- * Wurttemberg, 25 0 Slippery Rock.
- * Yellow House, 10 1 Allentown.
- * Zionville Sta., 10 1 Allentown.

QUEBEC.

- Beauce Juno. Hulets Landing.
- Bulwer. St. Alphonse de la Grand
- Entis. Boie.

- * Amherst Harbor, Magdalen Islands, 75 5 No. Sydney, N.S.
- * Etang du Nord, Magdalen Islands, 75 5 No. Sydney, N.S.
- * Grosse Isle, Magdalen Islands, 75 5 North Sydney, N.S.
- * House Harbor, Magdalen Islands, 75 5 No. Sydney, N.S.

RHODE ISLAND.

- * Barrington, 25 0 by telephone, Providence.
- * Caspachet, 25 0 by telephone, Providence.
- * Hamilton, 25 0 by telephone, Providence.
- * Wrentham, 25 0 by telephone, Providence.

SOUTH CAROLINA.

- 163 Black's. 146 Ravensels. 174 Welford.
- 146 Jacksonboro.

TENNESSEE.

- 292 Bellevue. 255 Sunbright. 215 Whitesburg.
- 245 Courtville. 183 Union Depot. 340 Withe.
- 245 Lansing. 292 White Bluffs.
- * Obion, 25 2, Rives.

TEXAS.

- 500 Abbott. 603 Eddy. 657 Sierra Blanca (So.)
- 652 Albany. 510 Farmersville. 656 San Martin (So.)
- 500 Alcedo. 460 Forest. 603 Temple Juno.
- 651 Alexander. 674 Haymond (South). 490 Thoradale.
- 656 Antelope (South). 654 Iatan (South). 648 Trinity Mills.
- 659 Atascosa (South). 603 Lorena. 603 Troy.
- 479 Bagwells. 470 Lodi. 480 Tucker.
- 657 Boracho (South). 655 Metz (South). 670 Twobig (So.)
- 652 Bremen. 673 Marfa (South). 471 Wayne.
- 670 Catulla (South). 486 Margaret. 671 Webb (South).
- 657 Cariso Pass (So). 659 Odessa (South). 500 West.
- 470 Carroll's Prairie. 656 Pearsall (South). 657 Wildhorse (South).
- 485 Clear Creek. 655 Pyote (South). 483 Winona.
- 495 Cuero (South). 656 Sand Hills (So). 489 Wharton.
- 670 Encinal (South). 830 San Elizario (So). 830 Ysleta (So)

- * Aguilares, 60 3 Corpus Christi, or 30 2 Laredo.
- * Benavides, 40 3 Corpus Christi, or Laredo.
- * Henrietta, 25 1 Denison.
- * Kounts, 35 2 Beaumont.
- * Los Angeles, 60 3 Corpus Christi, or 30 2 Laredo
- * Pena, 40 3 Corpus Christi, or Laredo.
- * Realitos, 40 3 Corpus Christi.
- * Salado, 40 3, Austin.
- * San Diego, 40 3 Corpus Christi, or 50 3 Laredo.
- * Village, 40 2 Beaumont.

UTAH.

- 575 Hot Springs.

VERMONT.

- 27 Miles Pond. Ok. St. 31 Pompanoosuc.
- Johnsbury. 39 South Wallingford.
- 27 Passumpsic.
- * East Arlington, 10 1 Arlington.
- * E. Rupert, 15 2 Factory Point.
- * Guilford, 10 0 by telephone, Brattleboro.
- * Hartwellville, 20 1 by telephone, No. Adams, Mass.

- * Jacksonville, 25 2 by telephone, No. Adams, Mass.
- * North Stamford, 15 1 by telephone, No. Adams, Mass.
- * Readsboro, 20 1 by telephone, No. Adams, Mass.
- * Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
- * Sadauga, 25 2 by telephone, No. Adams, Mass.
- * Stamford, 15 1 by telephone, No. Adams, Mass.
- * Wells, 15 2 Factory Point.
- * West Arlington, 15 1 Arlington.
- * West Dover, 25 0 by telephone, Brattleboro.
- * Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

- 123 Afton. 114 Concord. 163 Roanoke.
- 114 Appomattox. 169 New River Depot. 96 Wilson's Depot.
- 163 Clifton Forge. 95 Fl ins.
- * Indian Rock (N. M.) 40 3 Richmond.
- * Lairds, (N. M.), 40 3 Richmond.
- * Lee Hall, 30 2 Richmond.
- * New Market, Nelson Co., (N. M.) 25 2 Richmond.
- * Rallsbury, (N. M.), 40 3 Richmond.
- * Wilton (N. M.) 50 3 Richmond.
- * Yorktown, 45 3 Richmond.

WASHINGTON TERRITORY.

- 744 Carbonado. 722 So Texas. 784 White River.
- 774 Skagit City. 788 Touchet.

WEST VIRGINIA.

- * Coalmont, (N. M.) 30 2 Greenbrier, W. S. Spgs. or 4 3
- Huntington.
- * Janelew, 45 4 Wheeling or Parkersburg.
- * Lost Creek, 45 4 Wheeling or Parkersburg.
- * Talcott, (N. M.) 25 2 Greenbrier, W. S. Spgs. or 50 3 Hun-
- tington.
- * Weston, 45 4 Wheeling or Parkersburg.

- * Charge for three extra words in messages to these offices:
- and accept only prepaid day messages.

WISCONSIN.

- 345 Barneveld. 839 Kempster. 306 Spring Meadow.
- 306 Calhoun. 356 Livingston. 325 Sullivan.
- 325 Cottage Grove. 325 London. 852 Superior Juno.
- 306 Douseman. 325 Marshall. 859 Summit Lake.
- 840 Eden, Fond du 306 No. Greenfield. 850 Tunnel City
- Lac, Co. -345 Prairie du Sac. 855 Turtle Lake.
- 852 Hayward. 847 Randolph. 306 Wales.
- 325 Jefferson Juno. 345 Sauk City.
- * Bailey's 25 2 Horn's Pier.
- * Big Suamico, 15 0 Green Bay.
- * Jacksonport, 25 2 Horn's pier.
- * Sturgeon Bay Canal, 25 2 Horn's Pier.
- * St. Josephs Pier. 25 2 Horn's Pier.
- * Whitefish Bay, Door Co., 25 2 Horn's Pier.

WYOMING.

- 573 Fossil. 551 Harper.

NORVIN GREEN

President

Just published. The new text-book,

COMMERCIAL & RAILWAY TELEGRAPHY

In Theory and Practice.

Arranged in questions and answers, 112 pages, 32 sections, illustrated; compiled and prepared by J. P. ABERNETHY, Supt. Telegraph. Paper, 75 cents. Cloth, \$1.00.

CONTENTS.

PART I. Instruction for beginners in manipulation and reading by sound.—Setting up instruments for learners to practice.

PART II. Electricity.—Electricity in general—Conductors' insulation and induction—Atmospheric electricity—Frictional electricity—Voltaic electricity, and Batteries for exciting it—Magnetism.

PART III. The Telegraph.—Relation of circuits and instruments—The line or main circuit—The local circuit—The key—Relay, Register and Sounder, and box relay, or main line sounder—Adjustment and care of instruments—The repeater—Duplex and quadruplex systems—Switches—Switchboards—Ground wires and lightning arresters—The galvanometer—Resistance coils—Rheostat—Condenser—Voltmeter, and the Wheaton's bridge—Telegraphic interruptions and the means of locating same—The telephone—Submarine telegraphy—The Atlantic cables, how worked, etc., etc.

PART IV. Management of Commercial Offices.—Transmitting messages—Receiving and delivery of messages—Press reports—Weather report U.S. Signal Service—Money orders by telegraph—The telegraph in Wall Street, New York—The "ticker"—Telegraphic bookkeeping and monthly reports.

PART V. Railway Telegraphy.—Management of railway offices—Train dispatchers' and operators' duties—Circuit regulations, etc.—Classification of trains—Train reports—Car reports—Time by telegraph—Railway signals—Numerals and abbreviations—Train orders, different forms of, etc., etc.—Block system, Pennsylvania R. R.—Station Agents' and station employes' duties—Freight department—Passenger or ticket department—Baggage department—Express—Railway station bookkeeping and accounts.

Price, 75 cents, or 3 copies \$2; cloth, \$1 each. Sent, post-paid, on receipt of price. Address

J. P. ABERNETHY, Supt. Tel.,
Cleveland, O.

OR
W. J. JOHNSTON,
No. 9 Murray St., New York.

A GREAT OFFER.

To Superintendents, Managers, Purchasing Agents
and others having on hand

Worn Out, Damaged or Useless Morse Keys,

We will, until further notice, furnish our

New Steel Lever Keys

in exchange for all old keys for a cash difference of \$1.66 each. This price applies to any number of keys, no matter in what condition the old ones may be. They must be delivered to us, in packages plainly marked KEYS, with all charges PREPAID, and remittance should accompany the orders, except from Superintendents and Purchasing Agents of well-known Companies.

Now is the time, while the offer holds good, to get together all of your

Used-up and "Bad" Keys

and exchange them for splendid New Ones. See description and advertisement of Steel Lever Key. Send for circular.

J. H. BUNNELL & CO.,

112 Liberty Street, N. Y.

FREE!

Complete Instruction in Telegraphy

If you wish to know all about learning Telegraphy, constructing and operating Short Lines of Telegraph, &c., send your address, by postal card or letter, and get J. H. Bunnell & Co.'s Manual of Instruction for Learners of Telegraphy, latest edition, which we will send

FREE OF CHARGE,

to all who apply, by mail or otherwise.

It is the plainest and best book of instruction in Telegraphy ever published, being fully complete in description, explanation and illustrations.

J. H. Bunnell & Co.,

112 Liberty Street, N. Y.



Every telegrapher knows, or ought to know by this time, what **THE OPERATOR** is—that it is **THE GREAT VEHICLE OF TELEGRAPHIC INTELLIGENCE AND FRATERNAL INTERCOURSE**, and is published **TWICE EVERY MONTH**—on the 1st and 15th—its many pages filled to overflowing with **NEWS INFORMATION, HINTS, AND SUGGESTIONS ABSOLUTELY INDISPENSABLE TO EVERY THOROUGH AND LIVE TELEGRAPHER**.—No ambitious young operator, and no progressive old one, can **AFFORD TO LOSE THE DRIFT OF CURRENT EVENTS**, with which he can only keep abreast by carefully studying his class paper, and filing it away for reference and comparison.

THE CIRCULATION OF 'THE OPERATOR' HAS ALMOST DOUBLED DURING THE PAST YEAR, and subscribers all say they **COULD NOT NOW GET ALONG WITHOUT IT**. There are doubtless thousands more who would have a similar experience. To induce them to give the paper a **FAIR TRIAL**, we will send it to them from

June 1st until Dec 15th 1882,

(or fourteen numbers) on receipt of

FIFTY CENTS.

U. S. Postage stamps taken. Order at once.

For \$1.00 we will send the numbers from January 1st complete for the whole year.

To any one sending us a club of **FOUR 50c.** subscriptions as above we will send one extra copy free. Or for orders for any of our books amounting, at regular retail prices to \$4, we will send a copy of the paper regularly every issue **FOR A YEAR** free.

Books, etc., published by W. J. Johnston.

TELEPHONE AND OSKOSH. Two sparkling telegraphic burlesques, full of spicy fun. By T. C. Noble, Jr. "A treat from beginning to end." Illustrated. Paper 25c. Postage prepaid.

OAKUM PICKINGS. A miscellaneous collection of stories, sketches, essays, and paragraphs, telegraphic and general. By John Oakum. 188 pp., paper, 50c.; cloth 75c.

WIRED LOVE. A Romance of Dots and Dashes. By Ella Cheever Thayer. An exceedingly interesting, amusing and popular work, and the only telegraphic novel published. Every telegrapher should read it. "A good book to make you forget business and cares, and leaves pleasant memories behind it."—*Inter-Ocean*. 256 pp., cloth 75c.

SAM JOHNSON. The Experience and Observations of a Railroad Telegraph Operator. By J. Albert Clippinger, author of "The Pedagogue of Widow's Gulch," "Samson Papers," etc. "One of the most entertaining books in the whole library of Railway Literature."—*Railroader*. 176 pp., paper 50c.; cloth, \$1.

COMMERCIAL AND RAILWAY TELEGRAPHY. In theory and practice. Compiled and prepared by J. P. Abernethy, Supt. Telegraph. 112 pages. Illustrated. Boards 75 cents. Cloth \$1.

PRACTICAL INFORMATION FOR TELEPHONISTS. By T. D. Lockwood, Electrician American Bell Telephone Co. A series of admirable papers on practical telephonic working (new). 192 pp., cloth \$1.

TELEGRAPHIC TALES AND TELEGRAPHIC HISTORY. A popular account of the Electric Telegraph, its uses, extent and outgrowth. By W. J. Johnston, Editor of **THE OPERATOR**. "It is seldom that a book containing so much substantial and not easily accessible material of a specific kind is commended to a wide audience by a careful and pleasing literary treatment."—*New York Sun*. Second Edition, revised and enlarged. 286 pages, cloth \$1.

THE AMERICAN POPULAR DICTIONARY. A Perfect Library of Reference in one handy volume, containing every useful word to be found in the English language, with its true meaning, derivation, spelling and pronunciation. This work has already met with an immense sale, and everywhere gives satisfaction. 510 pp., cloth \$1.

Any of the above, or any other book, newspaper, or magazine published, scientific or popular, telegraphic or non-telegraphic, will be forwarded, **POSTAGE PREPAID** on receipt of the price.

Complete circulars of all the books, etc., published and for sale by W. J. Johnston, also of telegraphers' jewelry, and sample copies of **THE OPERATOR**, mailed free on application.

The size and shape of "Tales and History" having been much admired, new editions of "Wired Love" and "Oakum Pickings" have now been published uniform with "Tales and History." These three popular books will be mailed together, all bound in cloth and uniform in size, for \$2.00; or, with **THE OPERATOR** from May 1st until December 15th 1882, for \$2.50.

Remit by Post-office order, draft, registered letter or express. U. S. Postage stamps taken. Address

W. J. JOHNSTON, Publisher,

No. 9 Murray Street, New York.

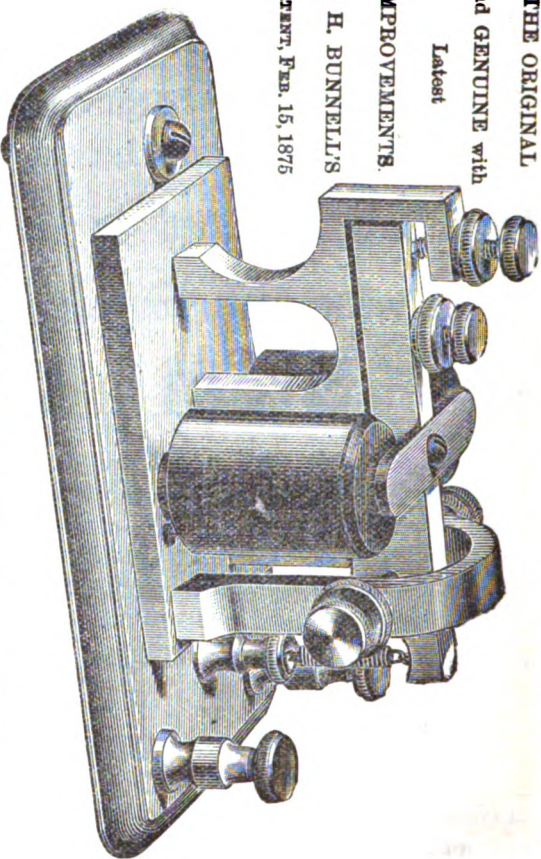
Another Great Reduction in Prices ! !

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS.

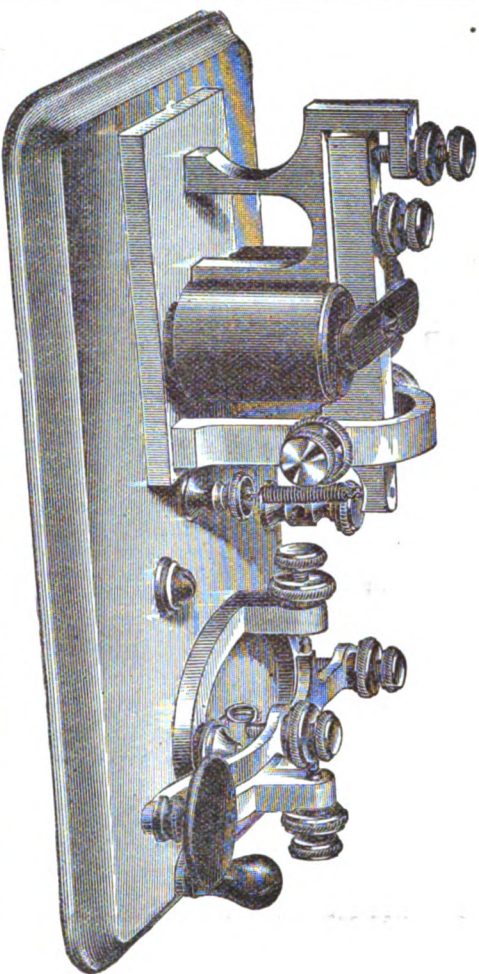
J. H. BUNNELL'S

PATENT, FEB. 15, 1875



THE GIANT SOUNDER—UNEQUALLED! \$4.00.

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$4.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

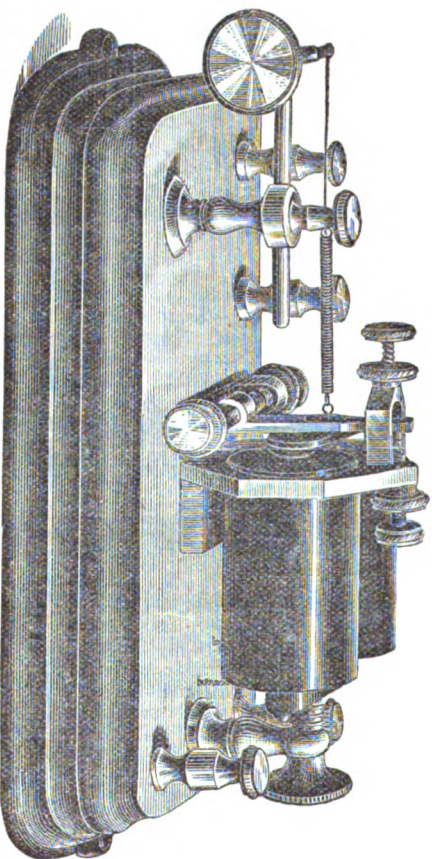
COMBINATION SET: \$7.50.

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$7.50, carefully boxed and sent by mail, prepaid, to any part of the United States.

All of these prices subject to liberal discount on orders in quantity.

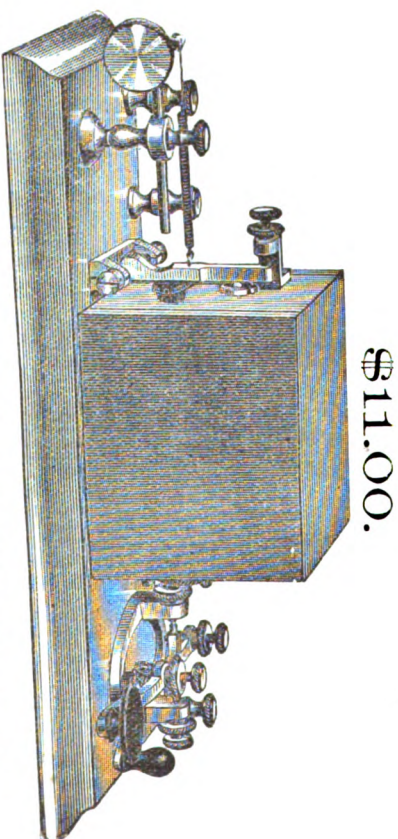
J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.

\$7.50.



FIRST CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Subbase, Extension Adjustment. Price, \$7.50.



\$11.00.

BOX SOUNDING RELAY AND STEEL LEVER KEY.

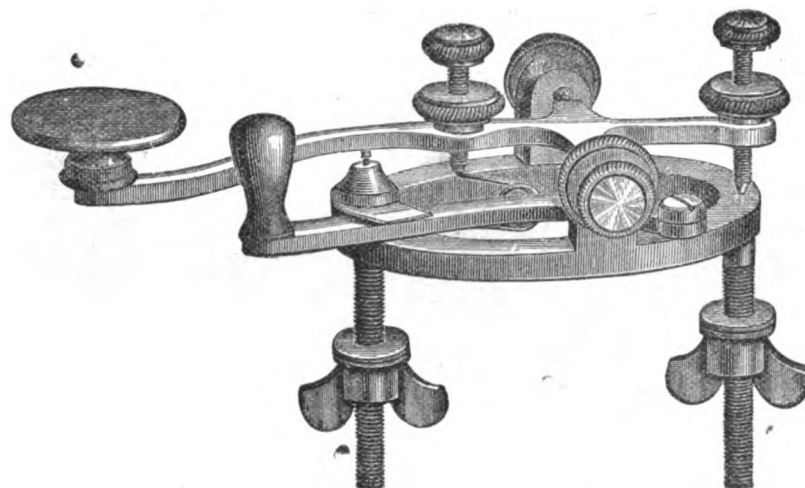
COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without loss of sound. Polished Mahogany Box and Base; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$11.00; without Key, \$8.50.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:

The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Our Steel Lever Solid Trunnion Key

is now well known throughout the United States and Canadas as being the most satisfactory, durable and perfect key for Morse Telegraphing.

Its great popularity since its first introduction has caused many attempts to produce a key having at least equal merit. But, after two years' trial in thousands of different places, it still remains

“A Number 1,” Ahead of all,

while its competitors drop out and cease to be heard from.

Various absurd contrivances will, no doubt, continue to be put forward as being equal or better keys, but we would say to all who wish to possess a perfect instrument that

“The Bunnell Steel Lever Key”

is beyond all comparison,

THE BEST.

J. H. BUNNELL & CO.,

FIRST-CLASS TELEGRAPH INSTRUMENTS & MATERIALS OF EVERY DESCRIPTION,

112 Liberty Street, New York,

CHARLES WILLIAMS, JR.,

ESTABLISHED IN 1856,

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells
District Bells and Switches for Exchanges, Annunciators, etc

TELEGRAPH & ELECTRICAL INSTRUMENTS.

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

GEO. WINTINGHOUSE, Jr. Pres. RAUFEL BASALTY, V. Pres. & Treas.
O. H. JACKSON, Gen'l Manager. ADAM T. HOWARD, Secretary.
HENRY SWYDER, General Agent,

THE UNION SWITCH & SIGNAL CO.,
PITTSBURGH PENNA.

A consolidation of
The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
sole Owners and Manufacturers of the only practically suc-
cessful

SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Elec-
tricity,

Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.

Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnish-
ed upon application

ESTABLISHED 1830.

ALFRED F. MOORE,

(Successor of JOSEPH MOORE & Sons)

MANUFACTURER OF

INSULATED TELEGRAPH WIRES,

200 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

INSTRUMENT AND OFFICE WIRES. FLEXIBLE CORDS. ANNUNCIATORS
AND BURGLAR ALARM WIRES. ELEVATOR CABLES.

All wire used is thoroughly tested for conductivity, therefore
ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP,

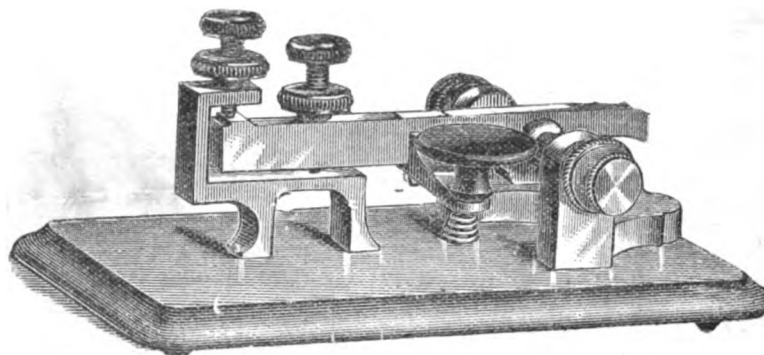
FOR FLEXIBLE CORDS.

Descriptive Circulars furnished upon application.

NEW MECHANICAL

TELEGRAPH INSTRUMENT.

PATENTED APRIL 4, 1882.



COMBINED KEY AND SOUNDER.

NO BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is *always ready for use.*

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or register-
ed letter.

J. H. BUNNELL & CO.,

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

**ILLUSTRATED CATALOGUES
OF MAY, 1882?**

If not, send your address by postal card or letter and you will get one by return mail

It contains Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instru-
ments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

Don't Read This!

NEW 1882 ILLUSTRATED INSTRUCTION BOOK. It is the MOST COMPLETE instruction book in the world.
C. E. JONES & BRO.: Dear Sirs.—Instruction Book received. O. K., and many thanks. It is worth five times what it cost. If a person
could not learn to be an operator after studying it, they had better give up. Yours truly, A. L. JAMES, Tipton, Tulare County, Cal.
Now! Right Now! while fresh in your mind, is the best time to send your order, before you misplace this
paper and forget our address, and your opportunity is gone. Remittances preferred in currency, 1c. or 2c. stamps.

C. E. JONES & BRO.,

MANUFACTURERS AND DEALERS IN

TELEGRAPH, TELEPHONE AND ELECTRICAL SUPPLIES.

NO. 51 WEST FOURTH STREET, CINCINNATI, OHIO.

WESTERN ELECTRIC MANUFACTURING COMPANY.

220-222 KIRK STREET, CHICAGO.

62-68 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES.

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Fan and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, M-Folger and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANSON STAGER, President. HENRY M. BARTON, V.-Pres.

ELIENIA GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE |
|---|--------|-------|
| I—Complete Set of Catalogues..... | 286 | 20c. |
| II—Telegraph Instruments and Supplies..... | 64 | 5c. |
| IV—Insulated Wire (included in II) | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 32 | 3c. |
| VI—Electro-Medical Apparatus..... | 32 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 32 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 3c. |
| XI—Magnets for Mills..... | 20 | 3c. |
| Sir Wm. Thomson's Nautical Instruments... | 24 | 5c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,

AND

PLAIN AND OILED WIRE OF SUPERIOR
QUALITY,

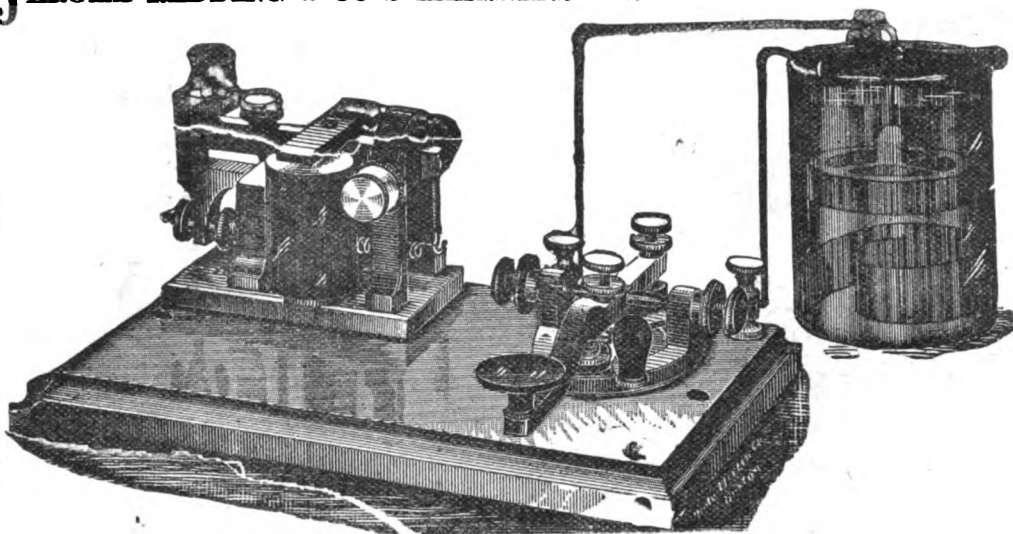
FROM SWEDISH CHARCOAL AND B B IRON.

BUT ONE JOINT PER BUNDLE.

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



PRICE FOR THE COMPLETE "GEM" LEARNERS' OUTFIT, \$4.20.

Consisting of the above large-sized Sounder and Key, a good Cell of Calland Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument made that has nicely finished brass Sounder and Key Levers with perfect adjustments for both.*

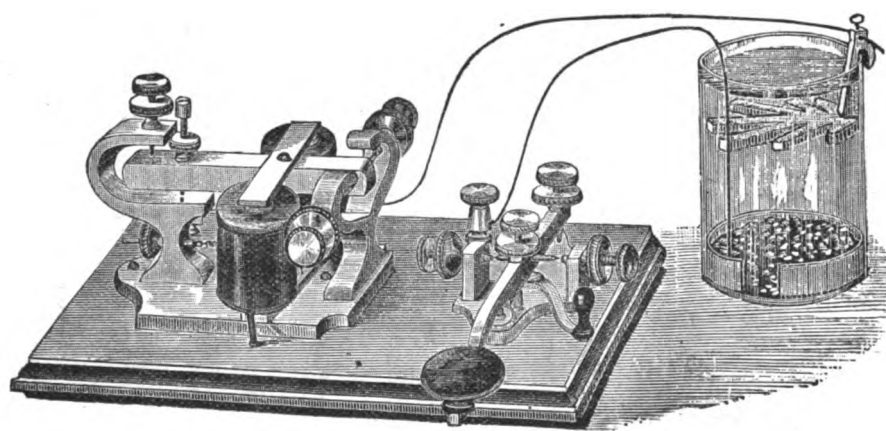
| | | | |
|---|--------|-----------------------------|-----------------------------|
| Price for Complete Outfit..... | \$4.20 | Price for Instrument alone, | 1 to 15 miles... \$4.00 |
| " " Instrument alone..... | 3.40 | " " " " | " " |
| " " Instrument alone, by mail, postpaid ... | 4.00 | " " " " | by mail, postpaid 4 5 |

SEND FOR CIRCULAR.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,

No. 80 HANOVER STREET, BOSTON, MASS.



No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of: Sounder, Key, either on 1 base or separate, 5x7, Calland Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent O. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

A. B. LYMAN, 36 South Water St., Cleveland, O.

PARTRICK & CARTER

TELEGRAPHIC SPECIALTIES.

THE GIANT SOUNDER PERFECTED.

Patented Feb. 16, 1876. Most perfect, reliable, clear toned; fine finish, and warranted the best working sounder in existence. Price, by mail, \$5.00.

THE "LATTIG" AUXILIARY LEVER NON-STICKING KEY.

PATENTED AUGUST 16, 1881. PRICE, \$5.00, BY MAIL.

This Key is very fine finish nickel-plated, and presents a beautiful appearance, is easy to handle and WARRANTED NEVER TO STICK. It has been extensively tried and has received the endorsement of the best operators in the country. It embodies the only true principle to prevent a Key from sticking by having a great separation between the anvil and hammer, without increasing the play of the Key lever, thereby preventing the formation of the "Electrical Arc" between the platina points, which is the PRIMARY CAUSE of STICKING KEYS. We claim this Key will never fail to make contact.

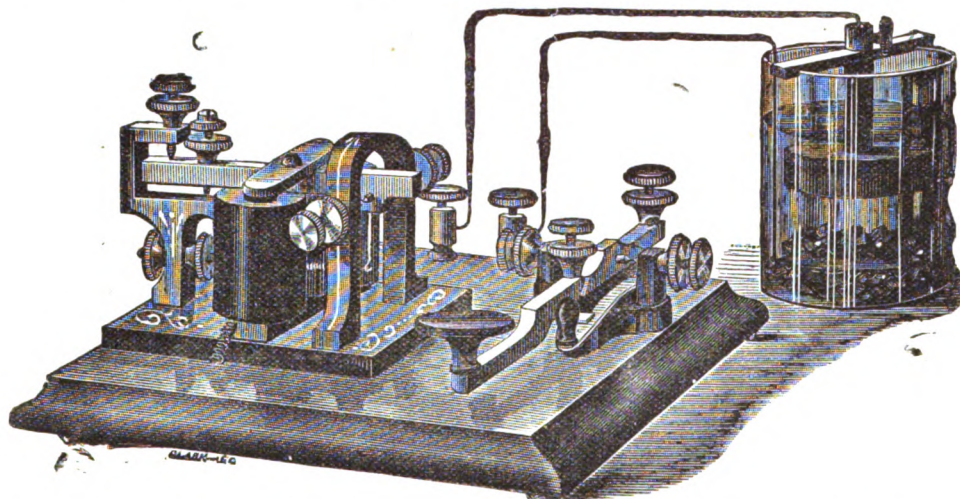
"THE EXCELSIOR KEY."

(PATENT APPLIED FOR.) PRICE \$2.50 BY MAIL.

This Key is made ENTIRELY OF BRASS NICKEL PLATED, with hardened platina points, and it is put forward to meet the long existing demand for a CHEAP, LIGHT, EASY WORKING, FIRST CLASS KEY, and is without doubt the CHEAPEST and BEST Key EVER OFFERED FOR THE MONEY.

Premium Learners' Apparatus.

Only \$5.00. Not the Cheapest, but Guaranteed the Best.



The PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER, PERFECTED," and "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Galland Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5.00, when the money accompanies the order. The great number of these Instruments use is the best testimonial that can be offered.

| | |
|---|--------------------------|
| Price, Complete Outfit | Money in advance, \$5.00 |
| " Instrument without Battery | " " 4.20 |
| " Instrument without Battery, by Mail | " " 4.75 |

Remittances should be made by P. O. Money Order, Registered Letter, Draft or Express, which will insure safe delivery. Send for circulars.

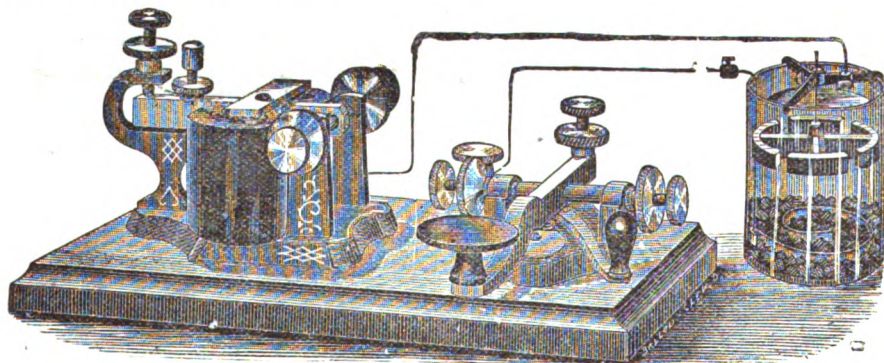
PARTRICK & CARTER,

No. 114 SOUTH SECOND STREET, PHILADELPHIA, PA.,

Manufacturers and Dealers in TELEGRAPH, TELEPHONE, AND ELECTRICAL INSTRUMENTS AND SUPPLIES OF EVERY DESCRIPTION. Send for Catalogues and Circulars.

SEND FOR OUR PRICES BEFORE PURCHASING ELSEWHERE.

EUREKA OUTFIT NO. 2.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

THE ABOVE OUTFIT AND MATERIAL ALL COMPLETE SENT ON RECEIPT OF \$4.25.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

Room 19, Leader Building, New York.

WESTERN

SCHOOL OF TELEGRAPHY.

JANESVILLE, WISCONSIN.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement, now of eight years standing, with the system of city lines in Chicago known as the Metropolitan Telegraph Company, having over 100 offices, and worked in connection with the Western Union Telegraph Company. These city lines draw their operators from this school, placing them first in sending offices and afterwards promoting them according to merit. The superintendents of telegraph of the different railroads centring at Chicago, employ many men from the city lines, and the Western Union Company does the same, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make of our students first class operators, nor to obtain for them first class situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

RICHARD VALENTINE, } MANAGER
A. M. VALENTINE, }

N. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have lately furnished the following Companies in this way: Wisconsin Central, Green Bay & Minn.; St. Paul, Minneapolis, & Manitoba; Chicago, St. Paul, Minneapolis & Omaha and Burlington & Northwestern.

We can also furnish, on short notice, experienced operators competent to manage any ordinary office, and reliable in every respect.



YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "78," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 either designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys, Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents;

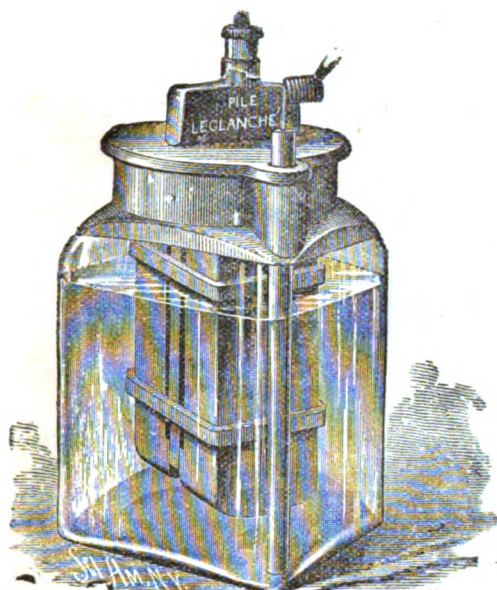
also Embellished Keys 25 for 25 cents. Samples of Operators' Cards, 10 cents. 50 New and laughable Illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 new and rich Transparent Picture Cards, with your name. 25 cents. 25 Tinted Portraits of Actresses, 25c. 25 side-splitting Comic Cards, 20c. Morocco card cases, two pockets, 10c. 180 finely printed letter heads, \$1.00. 100 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 10c. Agents Wanted to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also satin fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and Slipper cards, also French and American Chrome cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—\$300, no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from \$ to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,

F. P. MUNN, CLYDE, Wayne Co., N. Y.

SHORTHAND

Writing thoroughly taught by mail or personally. Situations procured for pupils when competent. Send for circular. W. G. CHAFFEE, Oswego, N. Y.

I will teach any operator the Corresponding Style of Phonography, who will sell a Calligraph for me.

LECLANCHE BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones,

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Plaques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of Infringements and Worthless Imitations.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity
Sine and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,

149 West 18th St., New York.

Or L. G. TILLOTSON & CO.,

5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FIBERED

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLES, ETC.

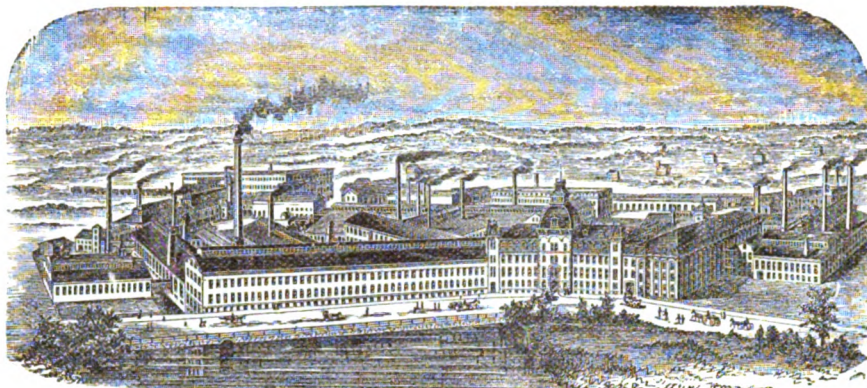
OFFICE AND FACTORY: 67 STEWART STREET,

PROVIDENCE, R. I.

W. H. SAWYER, Electrician and Sup't.

TELEGRAPH WIRE.**WASHBURN & MOEN MANUFACTURING COMPANY.**

ESTABLISHED 1861. CAPITAL \$1,500,000.

**WORCESTER, MASS.**

21 CLIFF STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequaled in that particular.

Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

(In connection with the DOUBLE SHEET FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

KERITE INSULATED TELEGRAPH WIRES AND CABLES

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by
all the leading men in the telegraphic profession

THE

DURABLE QUALITIES OF KERITE

RECOMMEND IT AS THE

CHEAPEST AND MOST ECONOMICAL

insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation furnished
at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic
material.

further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

W. H. HORTON, General Agent.

TELEPHONE WIRE.

THE AMERICAN BELL TELEPHONE COMPANY.

W. H. FORBES, President, W. K. DRIVER, Treasurer,

THO. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

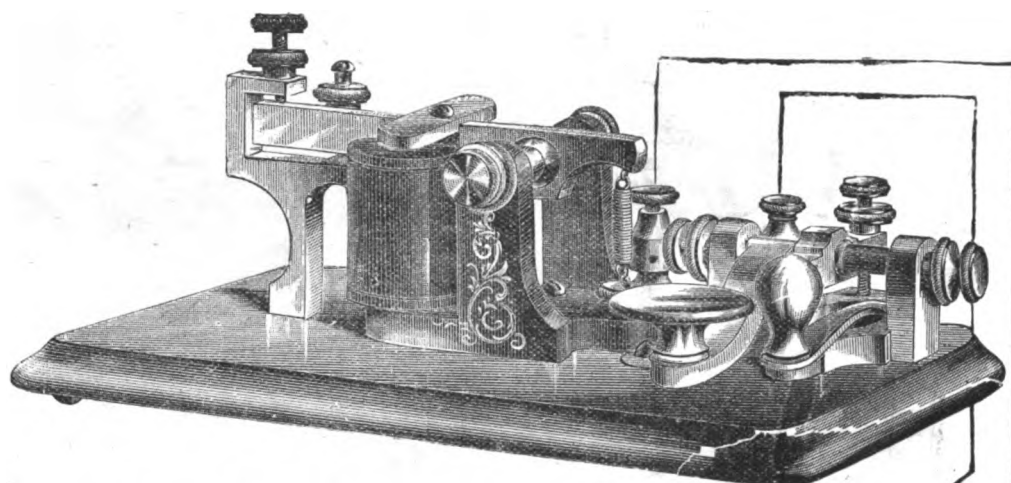
No. 95 MILK STREET,

BOSTON, MASS.

ALL persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

The "Morse" Learners' Outfit \$3.75.

**GREAT
REDUCTION
IN
PRICE!!
THE BEST.**



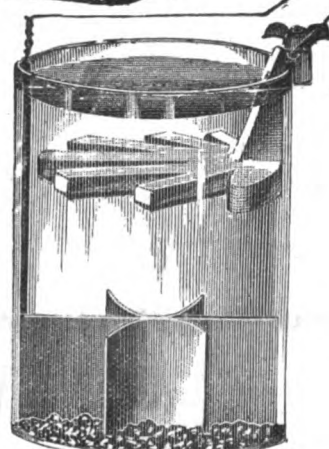
THE BEST.

Price, \$3.75, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.
 "Morse" instrument alone, without battery..... \$3.00
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 3.75
 Cell of battery complete..... .65
 "Morse" Learners' Instrument, without battery, sent by mail..... 3.50
 (Battery cannot be sent by mail.)

Instruction Book **FREE.**

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.
 Favorable arrangements made with Agents everywhere.



The "Morse"
 Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

**You are SURE of getting
 THE BEST THAT IS MADE
 IF YOU SELECT THE "MORSE."**

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.

CEDAR TELEGRAPH POLES,

50,000 for SALE, by

H. G. RIPLEY,
 East Saginaw, Mich.

Operators' Cramps cured by



**LITTLE GIANT
 FRENCH BATTERY**

Relieves Rheumatism
 and all Nervous Com-
 plaints. Supersedes all
 others. Send for circular.

C. E. JONES & BRO.
 Cincinnati, Ohio

**THE
 BROOK'S PATENT INSULATORS**

WERE AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1867.
 At the Vienna Exposition, 1873
 At the Cincinnati Industrial Exposition in 1874,
 And at the Centennial Exposition at Philadelphia in 1876,

MANUFACTURED AND FOR SALE BY

DAVID BROOKS,
 22 South 21st Street, Philadelphia.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
 With or without universal ankle motion. Remodeled, Im-
 proved and Warranted for Five Years. Prices Reduced. Send
 for Free Pamphlet.
GEO. B. FULLER,
 Successor to DR. D. BLY, Rochester, N. Y.

**BEST TELEPHONE EXCHANGE
 SWITCH BOARD.**

IN THE WORLD.

SUPERSEDING ALL OTHERS.

Sample and Circulars sent to Exchanges on

Application to

C. E. JONES & BRO.,
 CINCINNATI, OHIO.

Cornell University.

Departments of

Civil Engineering,

Mechanical Engineering,

and Architecture.

Entrance examinations June 12 and Sept. 19. For Annual Register containing requirements for admission and courses of instruction, with details as to the systems pursued, apply to the PRESIDENT OF THE UNIVERSITY, or the DEANS OF THE DEPARTMENTS, at ITHACA, N. Y.

PAINE & LADD,

HALBERT E. PAINE,
 Late Comm'r Patents, } **Washington.**
 STORY B. LADD, } **D. C.**
 Solicitors of Patents and Attorneys in Patent Cases.

Found at Last.

A CHEAP

COUNTER CLIP,

(PATENT APPLIED FOR.)

CHEAPER THAN PASTE.

Blanks Removed Without Tearing.

Price, post-paid, 15 cents. Per doz., post-paid, \$1.50.
 Discounts to the Trade or to Telegraph Co.s in quantities.
 Larger sizes made to screw to wall, for Paper Bags, Wrapping
 Paper, &c. Address,

W. W. PRICHARD,
 Ironton, Ohio.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, JUNE 20. 1882.

WHOLE NO. 348.

THE DIRECT UNITED STATES CABLE.

In the gallery under the large clock the exhibit of the Direct United States Cable Company will be found in the Crystal Palace Exhibition in London. The company was originally formed in 1873, but the cables were not completely laid until some two years after. The system was open to the public for traffic on the 15th September, 1875.

The cable extends from Ballinskelligs Bay, County Kerry, Ireland, to Rye Beach, New Hampshire, United States, and has a total length of about 3,000 nautical miles. It is laid in two sections, the main station being about 2,450 miles from Ireland to Torbay, Nova Scotia, and the section about 550 miles from Torbay to Rye Beach, New Hampshire, U. S. A.

The company started business with a tariff of 1s. per word, but this lasted only a fortnight, and the earnings under this rate were unsatisfactory. The cables were interrupted on several occasions, and in November, 1875, the tariff was raised to 3s. per word, but again reduced in March, 1877, during competition with the Anglo-American Company, to 1s. per word. During the whole of this period the financial results were anything but encouraging, and no dividend whatever was paid to the shareholders, nor was anything placed to reserve. This led to a reconstruction of the company; Mr. Pender, M.P., became chairman, with Mr. J. W. Fuller, secretary and manager, and a joint-purse arrangement was made with the Anglo Company, the 3s. tariff being resumed. This tariff has since been varied, in consequence of further competition.

Joint-purse arrangements have also been entered into with the French Cable Company, and with the recently formed American Telegraph and Cable Company, and the tariff now established is 2s. per word, a tariff which we have reason to believe is considered moderate by the telegraphing public on both sides of the Atlantic.

The shareholders have every reason to be satisfied with the management of the company, seeing that since its reconstruction in 1877 a dividend at the rate of 5 per cent. has been regularly paid, and a substantial reserve fund accumulated. In its recent joint-purse arrangement the company has secured a strong alliance with the Western Union Telegraph Company of America, which owns and controls the whole of the telegraph service throughout the United States of America and Canada, and we hope that it marks the commencement of a long era of prosperity for the Direct Company and its allies.

The instruments exhibited at the Crystal Palace form a very interesting collection, and show the manner in which the company's entire system is worked between London, Liverpool and New York. On the land lines on the English side of the Atlantic the ordinary Morse printer is employed, while on the land lines on the American side the ordinary American sounder is in operation. Over the main section of the cable the mirror apparatus of Sir W.

Thomson is used, and over the short cable there is through working between Torbay and New York, with Allan and Brown's relay and the aid of manual translating apparatus at Rye Beach.

Both cables are worked with Muirhead's duplex apparatus, which has been the means of increasing their capacity to a very considerable extent giving, in fact, additional transmitting power throughout, equal to a second cable. From the above it will be interesting to note that there is actually only one transmission between the shores of Ireland and New York City, through direct working between Torbay and New York City having been established since the introduction of the Allan and Brown relay. The result of this has been a considerable acceleration in the time of transmission, which has been greatly appreciated by the public. As illustrations of the speed of the Direct Company's system, we may mention that ever since the company has been open for business the results of the "Oxford and Cambridge Boat Race," the "Derby," and other important sporting events in which Americans take the liveliest interest, have reached New York within 30 or 40 seconds after being handed in at the company's London office.—*The Electrician*.

THE DIFFERENCE BETWEEN A CYCLONE AND A TORNADO.

THE difference between a cyclone and a tornado is defined by Mr. William Ferris, of the United States coast survey, to be this: A cyclone is usually a broad, flat, gyrating disk of atmosphere, very much greater in width than altitude; a tornado is a column of gyrating air, the altitude of which is several times greater than its diameter. Cyclones are born of conditions extending over large areas; tornadoes depend rather upon the vertical relations of the atmosphere, and occur when, owing to local changes of temperature, the under strata of air bursts up through the overlying strata. The enormous velocities of the ascending currents of tornadoes are supposed to be caused by the difference between the gyrating velocities above and those on the surface. It is these ascending currents which carry up the vast bodies of water afterward precipitated in the form of a deluge of rain. The water is sometimes kept from falling by the ascending currents, and is often projecting outside the area of the tornado, when it falls in a gentle shower over a large area. When the weight of the water overbears the force of the ascending currents, there occurs the tremendous fall of rain known as a cloud burst. When the area of a tornado is very small, a land spout or water spout may be formed, according as it is over land and water. The width of these spouts ranges between two feet and 200, and their height from 30 to 1,500 feet. A white squall is an invisible spout formed when the dew point is low. The accompanying cloud is invisible because of its height, but below there is a raging and boiling sea, with a gyrat-

ing current of air above it. Land spouts and water spouts are hollow.

THE MAINTENANCE OF SOLAR TEMPERATURE.

AN estimate of the amount of heat poured down annually upon the surface of our earth may be formed from the fact that it exceeds a million times the heat producible by all the coal raised, which may be taken at 290,000,000 tons a year.

If, then, we depend upon solar radiation for our very existence from day to day, it cannot be said that we are only remotely interested in solar physics, and the question whether and how solar energy, comprising the rays of heat, of light, and the actinic rays, is likely to be maintained, is one in which we have as great a reversionary interest as we have in landed estate or other property.

If the amount of heat, or, more correctly speaking, of energy, supplied annually to our earth is great as compared with terrestrial quantities, that scattered abroad in all directions by the sun strikes us as something almost beyond conception.

The amount of heat radiated from the sun has been approximately computed by the aid of the pyrheliometer of Pouillet, and by the actinometers of Herschel, at 18,030,000 heat-units from every square foot of its surface per hour; or, expressed popularly, if coal were consumed on the surface of the sun in the most perfect manner, our total annual production of 290,000,000 tons, being the estimated produce of all the coal-mines of the earth, would suffice to keep solar radiation for only one forty-millionth part of a second; or if the earth were a mass of coal, and could be supplied by contract to the solar furnace-men, this supply would last them just thirty-six hours.

If the sun were surrounded by a solid sphere of a radius equal to the mean distance of the sun from the earth (95,000,000 miles), the whole of this prodigious amount of heat would be intercepted; but considering that the earth's apparent diameter as seen from the sun is only seventeen seconds, the earth can intercept only the 2,250-millionth part. Assuming that the other planetary bodies swell the amount of intercepted heat to this amount, there remains the important fact that 224999993-225000000 of the solar energy is radiated into space, and apparently lost to the solar system, and only utilized 1-225000000 or intercepted.

Notwithstanding this enormous loss of heat, solar temperature has not diminished sensibly for centuries, if we neglect the periodic changes, apparently connected with the appearance of sun-spots, that have been observed by Lockyer and others, and the question forces itself upon us, how this great loss can be sustained without producing an observable diminution of solar temperature, even within a human lifetime.—From "*A New Theory of the Sun*," by C. William Siemens, in *Popular Science Monthly* for June.

Journal of the Telegraph.

PUBLISHED MONTHLY, ON 20TH OF EACH MONTH, AT
195 BROADWAY.

THE JOURNAL is issued on the 20th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,730 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....\$ 1.50
One Copy, six months, postage included..... .75
Single Copies, 15 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$ 2.00
Half Inch " " 1.00
Quarter Column, " 4.00
Half " " 8.00
One " " 16.00

Outs charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, JUNE 20, 1882.

EXECUTIVE ORDER NO. 194.

Office Hours on the 4th of July.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, June 8th, 1882.

On Tuesday, July 4th, office hours will be from 8 to 10 o'clock A. M., and from 4 to 6 o'clock P. M., except at repeating stations and principal offices, which will be kept open as usual, but with such reduction of force on duty as circumstances will permit.

THOS. T. ECKERT,
General Manager.

PROPOSED CHANGE IN THE DESIGNATION OF DAILY TIME.

Among the few persons who propose the change in the standard of time in the United States, a large majority (92 per cent.) of them are in favor of numbering the hours from 1 to 24 consecutively, extending from midnight to midnight, and to number the hours between midnight and noon (1 to 12) precisely as at present, and to denote the hours between noon and midnight by letters of the alphabet. A more absurd proposition in regard to the matter cannot be suggested for popular use. The uniform standard of time scheme which we have before discussed is part of this scheme.

These questions were brought up at one of the sessions of the American Society of Civil Engineers in Washington, May 17th, where a report was presented in relation to the matter.

To ascertain the opinions of those whom it was thought were in favor of the change in the standard of time, a series of questions were sent to which replies were requested; 97 per cent. of these replies were in favor of the change in the standard of time. The adoption of the scheme in the

United States and Canada would, exclusive of Newfoundland and Alaska, have the effect of reducing the standards of time to four—these four standards to be precisely one hour apart and to govern the time of the whole country; and all railroads, telegraphs, steamboats and other purposes of trade and commerce, as well as local time, are to be regulated thereby.

It is to be observed that the great mass of the public, being those most interested in the change of local time, are not consulted, but are ignored in the matter. When the proposed change is attempted to be enforced, which it must be, if at all, by the enactment of a law in each State, then the people will undoubtedly express themselves in such a way as will not soon be forgotten by those who at present disregard them and their convenience.

If the people desire this change they will have it, and if they do not approve of it they will not accept it, that is all.

THE AMALGAMATION OF THE ENTIRE TELEGRAPHIC SYSTEM OF CANADA LEGALIZED.

In the Senate of Canada, at Ottawa, on May 4, the act recently passed by the House of Commons legalizing the amalgamation of the entire telegraphic system of the Dominion, under the charter of the Great Northwestern Telegraph Company, of which Mr. Erastus Wiman, of New York, is president, was passed by a vote of 35 to 11. This consolidation was consummated some time ago, under the auspices of the Western Union Company, which by the privileges now granted to its annex, the Great Northwestern Telegraph Company, has secured several substantial and important advantages. The rate in Canada for the past two years under competition has been twenty cents for ten words, irrespective of distance. But this rate has been successfully advanced 20 per cent. to twenty-five cents, and is now legalized in such a manner as to make it almost absolutely permanent. An attempt to make it otherwise, should the profits be exorbitant, was proposed in amendment, of which the following was the concluding sentence: "No act of Parliament reducing the maximum rate herein provided shall be deemed an infringement of the privileges granted by this act." This amendment was voted down by a large majority, all the members of the government voting against it, Parliament thus practically affirming the arrangement made with the combined telegraph companies. An amendment to make the rate twenty cents for ten words received an emphatic quietus of 99 to 48, so that in every way the Commons indicated a disposition to give the contracting companies a sufficiently remunerative rate not only to do the work well but also to make some money.

To the Editor of the Journal of the Telegraph.

SIR: Referring to the death of Mr. Daniel T. Francis, of small-pox, in Chicago, January, 1882, below find statement of subscriptions and monies paid in from various sources, for the benefit of his widow:

| | |
|--|-------------|
| Total amount subscribed, | \$1,076.50. |
| March 4th, collected and paid beneficiary, | \$944.50 |
| May 7th, " " " " " | 66.00 |
| Total Cash, | \$1,010.50 |
| Uncollectable | \$66.00 |

The above statement, with receipts and a letter of appropriate acknowledgments from Mrs. Francis—as also several letters from subscribers—were for-

warded for publication in the last May issue of the JOURNAL, but by your note we learn that they were, in some way, mislaid or lost in transit. Therefore, to avoid further delay, we hastily forward this report in brief.

Mrs. Francis and children are now comfortably provided for, the lady having wisely invested a portion of the money in a profitable business. Until further and particular mention, we will only add assurance of her deep gratitude to those who have so kindly and generously testified this remembrance of her late husband and his bereaved family.

S. O. BRACKEN, { Relief Committee.
A. L. BAKER, }

CHICAGO, June 17th, 1882.

VIRALIA, KY., JUNE 16, 1882.

W. U. T. office at this place burned on the night of the 15th inst. Records all lost. Will you please publish officially, asking offices who had business with this office from June 1st to 15th, inclusive, to mail us copies of all messages?

Yours, &c.,

J. J. CALDWELL, Manager.

TELEPHONING FROM THE BOTTOM OF THE SEA.

An improvement has been made in diving apparatus at Constantinople. One of the glasses made in the helmet is replaced by a sheet of copper into which a telephone is fixed, so that the diver when at the bottom of the sea has only to slightly turn his head in order to receive instructions from above or report what he sees. It was the custom formerly to pull the diver up at intervals to relate what he discovered, which was more or less dangerous, the same being done when long and detailed instructions had to be given. But now an engineer, or even the captain can direct the divers' investigations by means of the telephone.

PROPOSED TELEGRAPH STATIONS IN THE OCEAN.

A FRENCHMAN, M. Mennisier, has just published a novel and bold plan for enabling vessels crossing the Atlantic to communicate with the mainland. Lay, he says, a telegraph cable between Saint Nazaire, Bordeaux and New York, with branch in mid-ocean. Every sixty leagues, the average daily distance covered by a ship, connect to the principal cable a vertical cable ending in a buoy at the surface. To the right and left of the principal cable lay two branch cables, ten to twenty leagues each, ending in a vertical cable with buoys. These branches would form two crosses with the main cable. The chances of ships sighting buoys would thus be frequent. Each buoy has a number, and its position in mid-ocean is known from special tables. When a ship passing near a buoy wishes to telegraph, it connects its apparatus wire, one with the wire of the buoy, the other with the buoy itself, which serves as an earth wire. Thus the ship might communicate with a central post, which should be established on an island or rock, or a ship moored according to Mennisier's system. A vessel in distress near one buoy might, through the central station, get help from a ship passing near the next buoy. The difficult matter would be the buoy. How would it resist storms that have broken cables? M. Mennisier has not yet described it in detail, but says it is pronounced quite successful by competent navigators. It is luminous by night, sonorous in fog, and easily accessible in any weather.

A NEW form of electric battery, costing only about 12 cents a cell, has been constructed by Mr. A. R. Bennet, of Glasgow, Scotland. The vessel and electro-negative plate consist of a "tin," such as is used for preserved meat, or milk, and into this tin is placed a porous pot containing a zinc plate stuck in a paraffined cork fitting the pot. Caustic soda in solution is the liquid employed, as it does not rust iron and is electro-negative to zinc. Iron filings around the iron plate of the vessel expedites the depolarization by facilitating the escape of hydrogen from their points. This cell was found to ring an electric bell twice as long as a Leclanché.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, June 20, 1882.

REVISION OF SPECIAL RATES.

Tuesday, August 1, 1882, all special rates, i. e., rates higher or lower than the regular (Square and State) rates of the Tariff Book, will be cancelled unless otherwise ordered before that date.

A revision of special rates has recently been made, and new lists will be issued, before August 1, to offices which, on and after that date, will continue to use special rates.

Offices having special rates not included in the new lists, and which, in the opinion of the manager it may be important to retain, should notify their superintendents of such rates as soon after July 20 (on which date the new special rates should be in the hands of managers who are to receive them) as possible, so that if advisable their retention may be authorized and ordered. If no authority is received to continue such rates after August 1, they must be cancelled on that date.

Rates less than twenty-five cents between offices in the same town or city are to be excepted from the operation of this order, they must not be changed unless changed by the new lists.

To all offices on Western Union lines:

The following changes which have been made since May 20, 1882, should be entered in the Tariff Book as they will not be republished.

CHANGES.

ARKANSAS.

Changes in the "tariff for other lines" from Little Rock:
Alma, 40 3. Mulberry, 40 3.
Clarksburg, 40 3. Ozark, 40 3.
Coal Hill, 40 3. Russellville, 25 3.
Ft. Smith, 40 3. Van Buren, 40 3.

CALIFORNIA.

762 Big Trees, O. County, closed.

COLORADO.

557 Bear Creek Junction, closed.
557 Mitchell P. O. is Rondebush.
598 Slaghts, closed.

CONNECTICUT.

29 Crescent Beach, reopened.

DAKOTA.

913 Alsop changed to 913 Cleveland.
924 Sixteenth bidding changed to 924 Sterling.
914 Westport, reopened.
947 Young Man's Butte changed to 947 Taylor.

DELAWARE.

59 Claymont now checked direct. Erase "ck. Linwood, Pa."
60 Rehoboth, reopened.

ILLINOIS.

288 Otto, closed.
The following at present given in the Tariff Book as "other" line offices, will now be checked direct at W. Union square and State rates;
327 Anchor. 317 Eylar. 296 Irwin.
317 Buckingham. 317 Flanagan. 317 Kempton.

317 Osbery.
327 Colfax.
317 Culom.

317 Graymont.
317 Griswold.
317 Hersher.

308 Risk.
327 Rosalthe.
317 Swygert.

INDIANA.

252 Hartford City is in Blackford Co.

INDIAN TERRITORY.

409 Ft. Gibson, closed.
Messages to the following named "other" line offices in Ind. Ter. may be sent via Dodge City, Kas. if more direct than via the routes given in Tariff Book.
Cantonment 25 1, Dodge City, Kas.
Fort Still 25 1, Dodge City, Kas.

IOWA.

416 Callanan, closed.

LOUISIANA.

• Donaldsonville, now W. Union office, square 395.
• Lake Providence reopened.
• Natchitoches now * Natchitoches 50 3 Prudhomme.
• Vidalia is now * Vidalia 15 2 (15 1 N.M. rate) Natchez.
Miss.

MASSACHUSETTS.

21 Nantasket Beach, reopened.
• Nantucket Island now 25 0 Woods Holl.
• Petersham now * Petersham 25 0 by telephone, Athol.

MEXICO.

• Lampazos 25 2 Laredo, Tex. or 184 17 Brownsville, Texas
• Nuevo Laredo 15 1 Laredo, Texas, 400 40 Brownsville, Texas, or 20 cents delivery from Laredo, Texas.
• Villaladama 37 3 Laredo, Tex., or 164 15 Brownsville, Tex.

On and after June 20th, 1882, messages to places in Mexico, except those named hereinafter should be sent and checked via Galveston, Texas instead of via Brownsville as at present. The "tariff for other lines" from Galveston will be the same as that now charged from Brownsville.

The "tariff for this line" to Galveston, Texas, on Mexican messages sent or received via that office, will be as follows:
(Enter these rates on page 121 of the Tariff Book.)

From any W. Union office in Louisiana and Texas.....60 and 4
From W. Union offices in Arizona, California, Idaho Nevada, Oregon, Utah and Washington Terr.....150 and 10
From all other W. Union offices in the United States.....125 and 8

From British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario and Quebec.....150 and 10

To the following named places, printed with the "tariff for other lines" from Brownsville, Texas, messages should be sent and checked via Brownsville as at present:

Tariff for "other" lines from Brownsville, Texas.
Bagdad.....50 4 Matamoros.....25 2
Cadereyta Jim.....115 14 Mier.....77 7
Camargo.....67 6 Monte Morelos.....149 13
Cerralvo.....95 9 Monterey.....124 11
Guerrero.....102 9 Reynosa.....60 4
Hualaco.....149 13 Salinas Victoria.....149 14
Lampazos.....184 17 Saltillo.....150 14
Laredo.....324 21 Ventura.....187 16
Linares.....164 16 Villagran.....189 17
Marin.....149 14 Villaladama.....164 15

MINNESOTA.

865 Benton changed to 865 Cologne.

MISSISSIPPI.

361 Nesbit reopened.

MISSOURI.

418 Laclede is in Linn County.

MONTANA.

* Ft. Keogh now W. Union office square 958.

NEW HAMPSHIRE.

17 Boars Head, reopened.
17 Farragut House, reopened.
17 Wentworth Hotel, reopened.
The following summer offices in New Hampshire will be open for business from July 1st to September 30.
27 Bethlehem.
27 Crawford House.
27 Glen House.
27 Maplewood Hotel, Bethlehem.
27 Mount Pleasant House.
27 Mount Washington.
27 Profile House.

NEW JERSEY.

47 Bellevue, reopened.
41 Deans is not open on Sundays.
41 Fallsides Mountain House, reopened.
• Red Bank Gloucester Co., now 100 0 Woodbury. Erase "25 1 Philadelphia, Pa."
• Somer's Point now W. Union office, square 42.

NEW MEXICO.

• Mesilla, closed.
633 Porter changed to 633 Florida.

NEW YORK.

33 Bath Kings Co., reopened.

83 Bay Ridge, reopened.

83 Brighton Beach, reopened.

83 Coney Island reopened.

40 Catskill Mt. House, reopened.

64 Constaterville, closed.

46 Greenwood Lake, reopened.

33 Lakeland changed to 33 Ronkonkoma.

• Lake Minnewaska Mountain House, reopened.

• Lake Mohonk Mountain House, reopened.

33 Laurelton Hall, reopened.

101 Liberty, Steuben Co., changed to 101 Cohocton.

33 Manhattant House, reopened.

33 Manhattan Beach, reopened.

40 Olive Branch or Olive Edge, reopened.

40 Paleville, reopened.

33 Prospect House, Shelter Island, reopened.

46 Sterling Junction, Orange Co., changed to 46 Sterling ton.

83 West Junction, closed.

OHIO.

233 Clenny's should read 233 Cleneay.

170 Fairview, Harrison Co., changed to 170 Jewett.

• New Baltimore should read * * New Baltimore. 15 0, Alliance.

213 South Fincastle, reopened.

222 Waynesville, closed.

PENNSYLVANIA.

• * Avenis, Erie Co., now W. Union office, square 150.

130 Clarendon now checked direct. Erase "Ok. Warren."

84 Datesmans changed to 84 W. Milton.

160 Fairview, Erie Co. now * Fairview, Erie Co., 10 0 by telephone, Avonia, E. Co.

151 Morganza, closed.

• * Mountain Park Home, 30 0 Wer. craville.

• * So. Mountain House, 35 0 Wernersville.

• * Sunnyside, 75 0 Wernersville.

59 Tacony is not open on Sundays.

47 Torresdale is not open on Sundays.

59 Unionville is in Berks Co.

PRINCE EDWARD ISLAND.

• Harmony, closed.

SOUTH CAROLINA.

• Georgetown 50 3 (30 2 N.M. rate) Kingstree.

TENNESSEE.

• Hurricane Springs, reopened.

265 Jasper, closed.

TEXAS.

• Decatur 25 1 Denison or San Antonio or 25 2 Ft. Worth.

470 Hughes Springs, reopened.

499 Wetmore, closed.

Messages to the following named other line offices in Texas may be sent via Dodge City, Kas. if more direct than via the routes given in Tariff Book.

Coleman City 50 2, Dodge City, Kas.

Concho 50 2, Dodge City, Kas.

Fort Elliott 25 1, Dodge City, Kas.

Graham City 25 1, Dodge City, Kas.

Jacksboro 25 1, Dodge City, Kas.

VERMONT.

39 Clarendon Springs, reopened.

38 Highgate Springs, reopened.

39 Lake Dunmore House, reopened.

39 Sudbury, reopened.

VIRGINIA.

86 Hanover Junc., changed to 86 R. F. & P. Junc.

• Rawley Springs, reopened.

123 Shenandoah Iron Works changed to 123 Milnes.

133 Warm Springs, reopened.

WISCONSIN.

• * Bay View now 25 0 Milwaukee.

306 Lakeside, reopened.

ATLANTIC CABLE.

Communication through the cables from:

Rio Grande do Sul to Montevideo and

Gutzlaff to Amoy, has been interrupted.

The cable between St. Vincent, Cape Verde Island and Pernambuco, South America, which was broken May 26, 1882, has been repaired.

The cable communication between Bahia and Rio de Janeiro, South America, has been interrupted.

CUBA CABLE.

Communications by cable between St. Vincent and Grenada between St. Thomas and St. Kitts is interrupted.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in three columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

| | | |
|---|----------------|----------------|
| 313 Akron. | 323 Epsos. | 267 Notasulga. |
| 285 Bangor. | 293 Fairville. | 324 Prichard. |
| 294 Calera. | 304 Massillon. | 266 Stock Mill |
| 323 Cuba. | | |
| * Alexander City, 40 3 (25 1 N. M. rate) Opelika. | | |
| * Dadeville 40 3 (25 1 N. M. rate) Opelika. | | |
| * Ft. Morgan, 75 6 Mobile. | | |
| * Gainesville, 25 2 Epsos. | | |
| * Point Clear, 50 3 Mobile. | | |

ARIZONA.

| | | |
|---|----------------|--------------|
| 639 Bowie Station. | 644 Gila Bend. | 659 Winslow. |
| 660 Canon Diablo. | 689 Mohave. | |
| 641 Contention. | 645 Sentinel. | |
| * Pinal, 50 4 (30 2 N. M. rate) Casa Grande. | | |
| * Silver King 50 4 (30 2 N. M. rate) Casa Grande. | | |

ARKANSAS.

| | | |
|----------------|------------------|----------------|
| 449 Brentwood. | 391 Jacksonport. | 449 West Fork. |
| 371 Knobel. | 401 Russell. | 449 Winslow. |

CALIFORNIA.

| | | |
|---|---------------------|---------------------|
| 800 Alameda Point. | 799 Norman Station. | 713 Volcano Springs |
| Ch. Alameda. | 800 Ocean View. | 847 Whitesboro. |
| 827 Albion Mills. | 720 San Geronimo. | |
| 800 Decoto. | 826 Table Bluff. | |
| * Bidwell's Bridge, 25 2 by telephone, Greenville | | |
| * Fall Brook, 40 3 San Diego. | | |
| * Lafayette, 15 4 by telephone, Martinez. | | |
| * Leesville, 50 3 Colusa. | | |
| * National City, 25 2 San Diego. | | |
| * Walnut Creek, 15 2 by telephone, Martinez. | | |

COLORADO.

| | | |
|------------------------------------|------------------|-------------------|
| 546 Agate. | 545 Hardin. | 550 Pinon. |
| 565 Boreas. | 590 Holleys. | 637 Red Cliff. |
| 623 Browns Canon. | 599 Hotense. | 634 Rockwood. |
| 540 Buffalo, Weld Co. | 623 Hot Springs. | 624 Argents. |
| 628 Calumet. | 614 Ignacio. | 635 Sedgwick. |
| 551 Carr. | 840 Hill. | 645 Snyder. |
| 540 Crook. | 552 La Salle. | 553 South Pueblo. |
| 546 Deuel. | 555 Oak Creek. | Ch. Pueblo. |
| 569 Earle. | 545 Orchard. | 699 Teanessa. |
| 541 First View. | 537 Pine Grove. | 593 Timpa. |
| * Akron, (N. M.) 65 4 Plattsmouth. | | |

* Al'sons 25 1 Gunnison.
 * Bonanza, (N. M.) 25 2 Villa Grove.
 * Conejos, 25 0 Antonito.
 * Eckley, (N. M.) 60 4 Plattsmouth, Neb.
 * Hyde, (N. M.) 60 4 Plattsmouth, Neb.
 * Rock Springs, (N. M.) 60 4 Plattsmouth, Neb.

CONNECTICUT.

| | | |
|--|----------------|----------------|
| 25 Goshen. | 37 Sandy Hook. | 29 South Lyme. |
| 26 Hop River. | 37 Southford. | 37 Steepney. |
| 25 No Windham. | 37 Southbury. | 25 Thompson. |
| * Bridgewater, 20 0 by telephone, New Milford. | | |
| * Naubuc, 30 3 Hartford. | | |
| * Noroton, 10 0 by telephone, Stamford. | | |
| * Warren, 20 0 by telephone, New Milford. | | |
| * Whitneyville, 50 0 New Haven. | | |
| * Winnipauk, 10 0 by telephone, Norwalk. | | |

DAKOTA.

| | | |
|---------------------|------------------|--------------------|
| 896 Big Stone City. | 890 Gardner. | 898 Montrose. |
| 940 Canning. | 947 Green River. | 920 Northville. |
| 916 Chamberlain. | 890 Hillsboro. | 915 O'way. |
| 913 Cheyenne. | 926 Hitchcock. | 904 Preston. |
| 947 Dickinson. | 947 Houston. | 924 Steele Sta. |
| 938 Eagle Nest. | 896 Kindred. | 924 Sterling. |
| 913 Eldridge. | 896 Mayville. | 947 Sully Springs. |
| 908 Ellendale. | 926 Miller. | 947 Taylor. |
| 930 Westington. | | |

* Crook City, 50 2 by telephone, Deadwood.
 * Colman, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
 * Dell Rapids, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
 * Egan, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
 * Fortisset, 25 1 Webster.
 * Howard, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
 * Madison, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.

* Pine Ridge Agency, 150 9 Cheyenne Wy.
 * Poplar River, 25 1 Bl. March.
 * Rosebud Agency, 175 10 Cheyenne, Wy.
 * Spear Fish, 50 2 by telephone, Deadwood.
 * Sturgis City, 50 2 by telephone, Deadwood.
 * Wintworth, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.

DELAWARE.

| | | |
|-----------------|--------------|-------------------------|
| 67 Bear. | 67 Har'ley. | 67 Porters. |
| 60 Broad Creek. | 67 Kiamendi. | 60 Ross, Summer office. |

FLORIDA.

* Blue Pond, 75 5, (50 3 N. M. rate) Lake City
 * Hawthorn, 75 5, (50 3 N. M. rate) Lake City
 * Highland, 50 4 Lake City.
 * Kestimee (N. M.) 150 10 Lake City.
 * Lochbie Sta. 75 5 (50 3 N. M. rate) Lake City.
 * Micanopy 75 5 (50 3 N. M. rate) Lake City.
 * Paola, (N. M.) 100 6 Lake City.
 * Perry Junction, 75 5, (50 3 N. M. rate) Lake City
 * Toocul, (N. M.) 50 3, Lake City.
 * Waits Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

| | | |
|--------------------------------------|--------------------|---------------------|
| 107 Dubois. | 226 Lawrenceville. | 226 Suwanee. |
| 146 East Point. | 186 Midville. | 187 Victoria Mills. |
| 147 Folkston. | 186 Perkins Junc. | |
| 176 Johnston. | 244 Roswell. | |
| * Abbeville (N. M.) 40 3 Ft. Gaines. | | |
| * Arlington, 40 3 Ft. Gaines. | | |
| * Blakely, 40 3 Ft. Gaines. | | |
| * Cedartown, 30 2 Cartersville. | | |
| * Senola, (N. M.) 25 2 Newnan. | | |

IDAHO.

| | | |
|---------------|---------------|-----------------|
| 578 Arimo. | 970 Rathdrum. | 970 Sand Point. |
| 970 Dry Lake. | | |

ILLINOIS.

| | | |
|-----------------------------------|---------------------|--------------------------|
| 316 Algonquin. | 368 Epperson. | Ok. 316 Richmond. |
| 300 Alton. | 368 Bushnell. | 309 St. Marie. |
| 307 Apine. | 307 Dumas. | 299 Sidell. |
| 316 Annawan. | 346 Forreston Junc. | 297 State Line, Lake Co. |
| 328 Beecher City. | 318 Gays. | |
| Edgingham Co. 318 | Hazel Dell. | 318 Stockton. |
| 329 Belknap. | 308 Henderson. | 346 Union Grove. |
| 298 Bonfield. | 357 Knox Ch. Galva. | 348 Wann. |
| 299 Boston. | 307 Mannheim. | 307 Wayne. |
| 336 Bureau, Ch. | 309 Montrose. | Edgingham Co. 309 |
| Princeton. | hain Co. | 318 West Liberty. |
| 353 Chesterfield. | 326 Nachusa. | 299 Wetzol. |
| 356 County Line Ch. | 307 New Lebanon. | 858 Wrights, Ch. |
| Kewanee. | 347 Oakford. | Greenfield. |
| 336 Duggan, Ok. Ke- | 358 Palmyra. | |
| waunee. | | |
| * Alton, 25 2 Huntingburg, Ind. | | |
| * Belmont, 25 2 Huntingburg, Ind. | | |

INDIANA.

| | | |
|---|-------------------|---------------------|
| 252 Briant. | 253 Letts Jorner. | 290 Paxton. |
| 300 Cynthiana. | 298 Lowell. | 293 Rose Lawn. |
| 252 Daleville. | 241 Maples. | 253 Sa dinia Cross- |
| 200 English Lake. | 262 Miroy. | ing. |
| 299 Fountain, Vigo | 280 Monon. | 271 Sedalia. |
| Co. | 300 New Harmony. | 253 Westport. |
| 270 Grangers. | 800 Owensville. | |
| 300 Ingles. | 261 Ossian. | |
| * Birdseye, 25 2 Huntingburg. | | |
| * Crandall, 25 2 Huntingburg. | | |
| * Ferdinand, by mail Ferdinand Station. | | |
| * Hartford, Crawford Co., 25 2 Huntingburg. | | |
| * Indiana, free, by telephone, Dana. | | |
| * Milwaukie, 25 2 Huntingburg. | | |
| * Morris City, 25 2 Huntingburg. | | |
| * Oakland City, 25 2 Huntingburg. | | |
| * St. Meinrad, by mail Ferdinand Station. | | |
| * Wayne City, 25 2 Huntingburg. | | |
| * Winslow, 25 2 Huntingburg. | | |

IOWA.

| | | |
|-----------------------|--------------------|-----------------------|
| 463 Alton. | 425 Hardy. | 417 Polo. |
| 428 Angus. | 416 Harcourt. | 463 Ransom. |
| 427 A-lton. | 414 Havelock. | 416 R-nwick. |
| 426 Bancroft. | 435 Henderson, Ch. | 546 Riggs, Ok. Pres- |
| 417 Bathany Junc. | Hastings. | ton. |
| Ch. Lamoni. | 428 Herndon. | 425 Rutens. |
| 425 Bradgate. | 425 Irvington. | 425 Rutland. |
| 448 Browns, Ok. Pres- | 416 Kamrar. | 473 Salf. |
| ton. | 454 Irwin. | 367 Sand Spring, Ok. |
| 367 Buffalo. | 435 Kallio. | Ansonia. |
| 425 Burt. | 445 Kirkman. | 444 Sioux Rapids. |
| 426 Cliv. | 888 La Crev. Ok. | 455 S. Iomon. |
| 4.6 Cooper. | Hamill. | 455 Stennett, Ch. Red |
| 426 Dakota City. | 435 Lake City. | Oak. |
| 367 Donahue, Ok. | 407 Laurel. | 416 Thor. |
| Dixon. | 444 Laurens. | 416 Tarrall. |
| 367 Fairport. | 397 Libertyville. | 407 Van Cleave. |
| 436 Farnhamville. | 435 Lehighville. | 417 Van Wert. |
| 454 Fletcher. | 444 Marathon. | 367 Viola, Ch. Stone |
| 4.6 Galt. | 367 Montpelier. | City. |
| 407 Girard. | 455 North Boro. | 425 West Bend. |
| 454 Gray. | 416 Pilot Mound. | |

KANSAS.

| | | |
|--|---------------------|--------------------|
| 517 Alum Creek. | 514 Galva. | 475 North Topeka, |
| 55 Argentine. | 507 Hazelton. | Ch. Topeka. |
| 466 Barclay. | 508 Horton. | 503 Strong City. |
| 521 Chase. | 456 Huron. | 518 Valley Center. |
| 47 Cleveland. | 527 Lenora. | 475 Wakarusa. |
| 517 Clifton. | 507 Leonard. | 447 Waseca Junc. |
| 427 Colyer. | 507 Milfordvale. | 466 Westphalia. |
| 03 Crawford. | 455 Mulberry Grove. | 465 Willis. |
| 427 Edmond. | 446 North Lawrence | |
| 4.6 Eye est | Ch. Lawrence. | |
| * Cottonwood Falls, 50 0 Strong City. | | |
| * Enterprise, 15 0, by telephone, Detroit. | | |

KENTUCKY.

| | | |
|---|----------------------|-------------------|
| 263 Bloomfield. | 263 Glencoe. | 263 Taylorsville. |
| 263 Crescent Hill. | 243 Pine Hill. | 339 Wickliffe. |
| 243 Donerail. | 2-8 Rocky Hill. | |
| 263 Finchville. | 263 South Louisville | |
| * Clay Lick, 25 1 by telephone, Worthville. | | |
| * Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Hunting- | | |
| ton, W. Va. | | |
| * Eastern Junc., 50 3 Lexington, Ky., or 35 2 Hunting- | | |
| ton, W. Va. | | |
| * East Ky. Junc., 35 2 Huntington, W. Va. | | |
| * Flemingsburg, 15 2 by telephone, Johnson Junc. | | |
| * Glatville, 25 1 by telephone, Worthville. | | |
| * Gratz, 25 1 by telephone, Worthville. | | |
| * Kilgore, 30 2 Hunt: gton, W. Va. | | |
| * Lockport, 25 1 by telephone, Worthville. | | |
| * Marion, 15 1 by telephone, Worthville. | | |
| * Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, | | |
| W. Va. | | |
| * Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. | | |
| Va. | | |
| * Peach Orchard, 25 2 Catlettsburg | | |
| * Pine Grove, 50 3 Huntington, W. Va. | | |
| * Port Hille, 25 1 by telephone, Worthville. | | |
| * Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va. | | |
| * Springfield, 20 1 by telephone, Worthville. | | |

LOUISIANA.

| | | |
|---|-------------------|---------------------|
| 404 Atchafalaya. | 395 Grosse Tete. | 433 Prudhomme. |
| 395 Baton Rouge Jc. | 354 Lookout. | 433 Robeline. |
| 424 Bayce. | 424 Leco pte. | 442 San Patrice. |
| 424 Bona. | 444 Mermentau. | 433 Sinnott. |
| 424 Garland. | 431 Moreland. | 442 Stonewall. |
| 442 Gloster. | 895 Plaquemine. | 395 Vacherie. |
| 375 Goulsboro. | 442 Piasant Hill. | 395 W. Baton Rouge. |
| 442 Grand Cane. | 433 Provencal. | 424 Whitesville. |
| * Fadoche, 50 3 (30 2 N. M. rate), New Orleans. | | |
| * Milliken Bend (N. M.) 40 3 Ta lulah. | | |
| * St. James, 50 3 (30 2 N. M. rate), New Orleans. | | |

MAINE.

4 Presque Isle.
 * La Grange, 25 2 Bangor.
 * Sebce, 25 2 Bangor.
 * So. La Grange 25 2 Bangor.

MANITOBA.

| | | |
|------------|-------------------|--------------------|
| Anstin. | Portage La Prais- | Sewell. |
| Brandon. | rie Sta. | St. Boniface Junc. |
| Jewtown. | Reburn. | Westbourne. |
| Gladstone. | Rosser. | West Lynne. |

The above named offices in Manitoba should be checked direct at the Manitoba State rate.

MARYLAND.

| | | |
|--|-----------------|---------------------|
| 85 Ashland. | 60 Fruitland. | 54 Peninsular Junc. |
| 67 Black, summer | 55 Lutherville. | 54 Pocomoke Sta- |
| office. | 77 Sparrow. | tion Ch. Poko- |
| 77 B-wie. | 67 Octoron. | make City. |
| 67 Edgewood. | 85 Odenton. | |
| * Gaithersburg, 25 2 Baltimore. | | |
| * Hyattsville, 25 2 Baltimore, Md., or Washington, D. C. | | |

Charge for three extra words in messages to Gaithersburg and Hyattsville, and accept only prepaid day messages.

MASSACHUSETTS.

| | | |
|--|--------------------|--------------|
| 86 Conway. | 21 Welleley Hills. | 21 Tyngboro. |
| 25 Oxford. | 12 W. Harwich, Ch. | Lewisport. |
| * Asylum Sta., 75 0 Danvers. | | |
| * B. & N. River Harbor, free by telephone, So. Dennis. | | |
| * Burlington 150 0 Woburn. | | |
| * Cohasset, 25 0 by telephone, East Bridgewater. | | |
| * Collins' Mills, Dracut, 15 1 by telephone, Lowell. | | |
| * Cummingsville, 50 0 Woburn. | | |
| * Danvers Centre, 25 0 Danvers. | | |
| * Danvers Insane Hospital, free by telephone, Salem. | | |
| * Danversport, 2 0 Danvers. | | |
| * Dracut Navy Yard, 15 1 by telephone, Lowell. | | |
| * Force Village, 15 1 by telephone, Lowell. | | |
| * Gardner, 15 0 Gardner Depot. | | |
| * G. Antville, 15 1 by telephone, Lowell. | | |
| * Holliston, free, Braintree. | | |
| * Hyannisport, 15 0 by telephone Hyannis. | | |
| * Lynnburg, 20 0 by telephone, Fitchburg. | | |
| * Mattfeld, 50 0 East Bridgewater. | | |
| * Melrose Highlands, 25 0 Melrose. | | |
| * Middlesex Village, 15 1 by telephone, Lowell. | | |
| * No. Middleboro, 150 0 Middleboro. | | |
| * No. Woburn, 15 0 Woburn. | | |
| * Phoenix Village Tewksbury, 15 1 by telephone, Lowell. | | |
| * Rock, 150 0 Middleboro. | | |
| * South Bitterica, 15 1 by telephone, Lowell. | | |
| * So. Oadner, 15 0 Gardner Depot. | | |
| * South Mills, 10 0 by telephone, New Bedford. | | |
| * Westham, 35 0 by telephone, Providence, R. I. | | |
| * West Bridgewater, 15 0 by telephone, East Bridgewater. | | |
| * W. Chelmsford, 15 1 by telephone, Lowell. | | |
| * W. Danvers, 150 0 Danvers. | | |
| * Westford, 25 0, Westford Depot. | | |
| * Westford Depot, 15 1 by telephone, Lowell. | | |
| * West Gardner, 15 0 Gardner Depot. | | |
| * Woburn Highlands, 25 0 Woburn. | | |

MEXICO.

* La Jarita, 25 2 Laredo, Texas.
 * P. & N. del Norte, 50 0 El Paso, Tex.
 * Parral de Hidalgo, 450 43 Brownsville, Texa
 * Rodriguez, 25 2 Laredo, Texas.

MICHIGAN.

| | | |
|---------------------|--------------------|--------------------|
| 138 Beaver Lake. | 210 Fostoria. | 231 North Fayette. |
| 220 Bech. | 127 Freedom. | 231 North Moreand. |
| 209 Bownes. | 119 Free soil. | 250 Orleans. |
| 231 Brigg water. | 230 Garfield. | 270 Penn. |
| 211 Britton. | 137 Hobart. | 838 Powers (north) |
| 211 Brockway Centre | 127 Indian River. | Ch. Spalding. |
| 210 Brown City. | 231 Jerome. | 260 Ransom. |
| 240 Collins. | 119 Manistee Junc. | 200 Ransome. |
| 250 Orapo. | 210 Mariette. | 250 Shelbyville. |

836 Crystal Falls 210 Mayville. 127 Topinabee.
(north). 260 Moline. 127 Vanderbilt.
269 Diamond Lake 127 Mullet Lake. 100 Wetzell.
(k. White 233 Narenta. 127 Wolverine.
Cloud.

* Flushing, 15 0 by telephone, Flint.
* Munising, 40 3 (30 2 N. rate), Marquette.
* Newberry, 40 3 (30 2 N. M. rate) Marquette.
* Palms, 4 3 (30 2 N. M. rate) Marquette.
* St. Ignace, 40 3 (30 2 N. M. rate) Marquette.
* Seney, 40 3 (30 2 N. M. rate) Marquette.

MINNESOTA.

190 Argyle. 870 Green Isle. 883 Northcote.
865 Arlington. 874 Heming. 870 Oshawa.
875 Buffalo Lake. 889 Kennedy. 885 Parida's.
885 Clithral. 861 Lakeland. 892 Clayton.
865 Cologne. 861 Minnehaha. 860 Sturgeon Lake.
874 Deer Creek. 865 Minnetonka. 876 Vernon Centre.
880 Gardfield. 867 Mission Creek. 865 Waconia.
865 Gaylord. 890 Muskoda. 865 Winthrop.

* Currie, 25 2 Tracy.
* Deforest, 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis., or
35 2 Sioux Falls, Dak.
* Prairie Junction, 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis.,
or 35 2 Sioux Falls, Dak.

MISSISSIPPI.

363 Armistead. 851 Courtland. 363 Morton.
* Arcola, 85 6 Vicksburg.
* Johnsonville, 85 6 Vicksburg.
* Overley, 85 6 Vicksburg.
* Stoneville, 85 6 Vicksburg.

MISSOURI.

369 Creve Coeur Lake 388 Granger. 428 Montserrat.
457 Ellis. 388 Knox. 437 Napoleon.
369 Etlah. 369 La Jede, St. Louis 427 rampel.
427 Gault. Co. 398 Sneyville. Ok.
369 Gilmore. 437 Lake City. Shelby.
360 Grays Ridge. 349 Lakeville.
* Ashley, 10 0, by telephone, Bowling Green.
* Augusta, by mail, Labadie.
* Greenfield, 50 0 So. Greenfield.
* Lemons 25 2, Unionville.
* Purdin, 25 2 Unionville.

MONTANA.

958 Forsythe. 958 Martin. 583 Silver Bow Junc.
959 Guys Station. 956 Keith. 957 Terry.
957 Iron Butte. 583 Melrose.
* Billings, 25 1 Helena, or 50 2 Bismarck, Dak.
* Walkerville, 30 2 telephone Butte City.

NEBRASKA.

474 Adams. 464 Gilmore. 464 Springfield.
927 Atkinson. 27 Inman. 465 Stella.
474 Avoca. 922 Long Pine. 474 Talmage.
474 Brock. 464 Missouri Pacific 927 Stuart.
538 Chappell. Junc. 465 Verdon.
922 Clear Water. 474 Sheridan. 474 Weeping Water.
* Benkeman, (N. M.) 66 4 Plattsmouth.
* Burchard, (N. M.) 35 2 Plattsmouth.
* Hagler, (N. M.) 60 4, Plattsmouth.
* Liberty, (N. M.) 35 2 Plattsmouth.
* Stratton, (N. M.) 55 4 Plattsmouth.

NEVADA.

677 Junction. 676 Luning. 676 Soda Springs.

NEW BRUNSWICK.

8 Albert. 3 Lake Ha Ha 3 St. Louis
8 Carleton Sta
Port Elgin, 25 2, Sackville.

NEW HAMPSHIRE.

20 Intervale, summer 31 E. Lebanon. 20 Livermore.
office.
* Chesterfield, 25 0 by telephone, Brattleboro, Vt.
* Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
* Concord State Prison, 10 0 by telephone, Concord.
* North Hinsdale, 20 0 by telephone, Brattleboro, Vt.
* W. Concord, 15 1 telephone, Concord.

NEW JERSEY.

47 Bay Head. 47 Franklin (Essex 47 Magnolia
41 Brick Church. Mills. 53 Malaga, Summer
Tariff same as 47 Fork d River Sta office.
Orange. 53 Franklinville. 41 Oradell.
53 Cedar Brook. Summer office 52 Valley.
41 Centerville Pas- 47 Hartford. 47 Waretown.
sale Co. 41 H. Witts. 41 West Orange.
47 Chadwicks. 41 Iselin.
41 Clementon. 47 Kingston.

NEW MEXICO.

559 Blossburg. 638 Gage. 632 Monero.
566 Cerrillos. 637 Gallup. 630 San Antonio.
587 Coolidge. 630 Hot Springs. 638 Separ.
559 Dillon. 638 Lava. 639 Stein's Pass.
633 Flo ida. 626 La Joya. 636 Upham.
828 Fort Selden, Ok. 559 Lynn, Ok.
Las Cruces. Morley, Col.
* Fort Stanton, 25 3 San Marcial.
* Fort Union, 25 2, Watrous.
* Ojo Caliente, 50 0 Barranca.

NEW YORK.

64 Albion Station, 101 Halbert.
Owego Co. Ok. 41 Artsdale.
Sard Bank. 40 Hen-onville.
65 Ansonia. 58 Jeffersonville.
33 Broad Channel, 56 Keeneville.
Rockaway Beach 44 Lake House.
Summer-office, 46 Livingston Man-
b'k R. Beach. or. 41 Tarrytown Sta.
111 Ceres. 83 Lowmanville. 44 Trembly's Iron.
101 Cohocton. 64 Manneville. 65 Works.
46 Cornwall-on-Hud- 74 McDonnellsville. 46 Vestal.
son. 44 Millers baranac. 46 Wallkill.
74 Fish Creek. 46 Milton. 37 West Patterson.
51 Fish's Eddy, Del- 83 Nichols. 71 West Vienna.
aware Co. 41 North Tarrytown. 46 Wicopee Junc.
38 Great Neck, L. I. 83 North Lansing.

* Bath-on-the-Hudson. 25 0 Albany
* Brushland, 25 2, Delhi.
* Ke. wood, 25 0 Albany.
* Minelink, Orange Co. 15 1 Port Jervis.
* Vernon, 10 0 by telephone, Oneida
* Whitestown, 75 0 U.ica.

NORTH CAROLINA.

205 Alexanders. 173 Newton. 194 Warm Springs.
125 Laurel Hill. 144 Rowan Mills. 98 Whiteville.
144 Jamestown.

* Falkland, 25 2 (25 1 N. M. rate), Tarboro.
* Pactolus, 40 3 (30 2 N. M. rate), Tarboro.

NOVA SCOTIA.

2 Albion Mines. 2 Sherbrooke.
* Baddeck, 25 2 North Sydney.
* Ingonish, 25 2 North Sydney.

OHIO.

221 Alvada. 202 Hadley Junction 242 Osgood Sta.
241 Alvorston. 170 Jewett. 192 Point Pleasant,
170 Barton. 202 Longstreth Gallia Co.
151 Brilliant. 221 Luckey. 252 St. Johns.
222 Browns. 221 McComb. 212 storms.
180 Creston. 221 McClure. 213 Wheelersburg.
232 Enterprise. 180 New Berlin, Stark 180 West View.
180 Everett, Summit Co. 232 Westville.
Co. 232 New Carlyle. 232 Yorkshire.

1-0 Fair Grounds. 213 Newport.
180 Gauga Lake. 159 North Benton.

* Anderson station, 10 0 by tel phone, Chillicothe.
* Andersonville, 10 0 by telephone, Chillicothe.
* Biers Run, 10 0 by telephone, Chillicothe.
* Brownstown, 10 0 by telephone, Chillicothe.
* Clarksburgh, 10 0 by telephone, Chillicothe.
* Da byville, 10 0 by telephone, Circleville.
* De Kaib, 25 2 Mansfield.
* East Orwell, (N. M.) 25 2 Ashtabula.
* Five Points 10 0 by telephone, Circleville.
* Greenland, 10 0 by telephone, Chillicothe.
* Hayville, Pickaway Co., 10 0 by telephone, Circleville.
* Hartville, 15 1 Minerva.
* Hayville, Ashland Co., 15 1 by telephone, Ashland.
* Jeromeville, 15 1 by telephone, Ashland.
* Klunkinnick, 10 0 by telephone, Chillicothe.
* Middle branch, 15 1 Minerva.
* Mogadore, 15 1 Minerva.
* Monroe Centre, 20 2 No. Kingsville.
* New Hazelton, 15 1 Minerva.
* No. Baltimore, 25 2 Defiance or Tiffin.
* Osnaburg, 15 1 Minerva.
* Pierpont, 25 2 No. Kingsville.
* Poland, face by telephone, Youngstown.
* R-d Lion, 15 1 by telephone, Franklin.
* Robertsville, 15 1 Minerva.
* Sherodsville, 15 1 Minerva.
* So. Elmwood, 10 0 by telephone, Circleville.
* Yellow Bud, 10 0 by telephone, Chillicothe.

OREGON.

785 Cascade Incline. 803 Hillsboro. 795 Whites.
* Alrie (N. M.) 50 3 Portland.
* Blue Mountain, 50 5 by telephone, Walla Walla, W. T.
* Fort Klamath, 50 3 Ashland.

PENNSYLVANIA.

64 Antes Fort. 93 Jackson Summit 84 Snyderstown.
140 Arthurs. 131 June Bug. 111 Songbird.
59 Berwyn. 76 Leaman Place. 140 S. & A. Junction.
131 Clarendon Depot 94 Lewistown Junc. Ck. Mercr.
66 Conyngham. 69 Logan, Phila Co. 151 South Side, Pitt.
52 Cresco, Monroe Ck. Wayne Junc. burg. Tariff
Co. 140 Lucinda Station. same as Pitts-
58 Dunmore, Ck. 59 Lukens, Ck. Nor- bu gh. Ck.
Scranton. rristown. Pittsburgh.
59 East Greenville. 84 Mainville. 131 Stonerville.
122 Elk Lick. 84 Mountain Grove 140 Stratonville.
151 Etna, Allegheny 140 Nesbannock Falls 130 Thompsons, War-
Co. 59 Rahn's, Ck. Col- ren Co.
140 Evansburg, But- lgeville. 150 Union City Depot
ler Co. 66 Plymouth Junc. 59 Virginsville, Ck.
151 Fallston. Ck. Plymouth. Moselem.
140 Garfield. 140 Rimersburg. 140 Volant.
59 Geigertown. 76 Richard, Ok. 150 Waterford Depot.
84 Georgetown. Sheridan Leb-30 Warren Depot.
59 Gibraltar, Ck. anon Co. 84 W. Millon Ck.
Bl dsboro 58 Rowland's. Montgomery.
66 Girard Manor. 94 St. Thomas. 151 Wildwood.
Ck. Ringtown. 111 Seaboard. 151 Wilkinsburg.
59 Glen Moore. 159 Shelby Tariff 55 Williamsburg.
59 Honey Brook. same as Qua- 151 Willow Grove.
66 Hunlock (open kerton, Ck. Allegheny Co.
June 1). Quakertown.
94 Hunter's Run. 130 Sh-field Depot. 140 Wilmington.
140 Jackson Centre. 159 Slippery Rock. 140 Zelenople.

* Academy Corners, 10 1 by telephone, Lawrenceville.
* Alms House, 10 1 Allentown.
* Alliettsville, 10 1 Allentown.
* Best sta. 10 1 Allentown.
* Centre Point, 10 1 Allentown.
* Centerville, Elk Co., free, by telephone, Seaboard.
* Churchville Berks Co., 10 1 Allentown.
* Clayton, 10 1 Allentown.
* Corning, 10 1 Allentown.
* Cowanesque Valley, 20 1 by telephone, Lawrenceville.
* Dillingersville, 10 1 Allentown.
* Elmer, 20 1 by telephone, Lawrenceville.
* Eagleville, 10 1 Allentown.
* Fairview, Montgomery Co., 10 1 Allentown.
* Eaglesville, 10 1 Allentown.
* Franklin, Lehigh Co., 10 1 Allentown.
* Gibrersville, 10 1 Allentown.
* Harrison Valley, 20 1 by telephone, Lawrenceville.
* Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.
* Ironton, 10 1 Allentown.
* Limerick Square, 10 1 Allentown.
* Lower Milford, 10 1 Allentown.
* Neffs, 10 1 Allentown.
* Nelson, 10 1 by telephone, Lawrenceville.
* New Berlin, 10 1 Allentown.
* Overbrook, free by telephone, Merion Sta., Montg'y Co.
* Pleasant Corner, 10 1 Allentown.
* Red Hill, 10 1 Allentown.

* Ruchsville, 10 1 Allentown.
* Saegersville, 10 1 Allentown.
* Schnecksville, 10 1 Allentown.
* Slatedale, 10 1 Allentown.
* Trappe, 10 1 Allentown.
* Unionville, Chester Co., 100 0 Kennett Square.
* Wurtzburg, 25 0 Slippery Rock.
* Yellow House, 40 1 Allentown.
* Zionsville Sta., 10 1 Allentown.

PRINCE EDWARD ISLAND.

* Bear River, 50 3 Sackville, N. B.
* Bedford 50 3 Sackville, N. B.
* Bloomfield, 50 3 Sackville N. B.
* Breada bom, 50 3 Sackville, N. B.
* County Line, 50 3 Sackville, N. B.
* Fr et wn, 50 3 Sackville, N. B.
* Monell, 50 3 Sackville, N. B.
* O'Leary, 50 3 Sackville, N. B.
* Port Hill Sta., 50 3 Sackville, N. B.
* Wellington, 50 3 Sackville, N. B.
* York, 50 3 Sackville, N. B.

QUEBEC.

Beauce Junc. Hulets Landing.
Bulwer. St. Alphonse de la Grand
Entis. Boie.
* Amherst Harbor, Magdalen Islands, 75 5 No. Sydney N.S.
* Etang du Nord, Magdalen Islands, 75 5 No. Sydney, N.S.
* Grosse Ile, Magdalen Islands, 75 5 North Sydney, N.S.
* House Harbor, Magdalen Islands, 75 5 No. Sydney, N.S.

RHODE ISLAND.

18 Riverside.
* Barrington, 25 0 by telephone, Providence.
* Chepachet, 25 0 by telephone, Providence.
* Hamilton, 25 0 by telephone, Providence.
* Wrentham, 25 0 by telephone, Providence.

SOUTH CAROLINA.

163 Black's. 146 Ravenels. 174 Welford.
146 Jacksonboro. TENNESSEE. 215 Whitesburg.
292 Bellevue. 265 Sunbright. 340 Withe.
245 Coulterville. 183 Union Depot.
245 Lausling. 292 White Bluffs.
* Obion, 25 2, Rives.

TEXAS.

500 Abbott. 510 Farmersville. 657 Sierra Blanca (So.)
654 Albany. 460 Forest. 656 San Martin (So.)
650 Aledo. 674 Haymond (South). 663 Temple Junc.
651 Alexander. 648 Hodge. 493 Thorndale.
656 Antelope (South) 654 Iatan (South). 603 Troy.
669 Atascosa (South) 603 Lorena. 480 Tucker.
479 Bagwells. 470 Lodi. 670 Twobig (So.)
657 Boracho (South). 655 Metz (South). 657 Van Horn, (South)
652 Bremen. 673 Marta (South). 470 Wayne.
670 Catulla (South). 466 Margara. 671 Webb (South).
657 Cariso Pass (So). 603 Mountain Home 500 West.
470 Carroll's Prairie. Bell Co. 657 Wildhorse (South)
485 Clear Creek. 669 Odessa (South). 483 Winona.
656 Cuero (South). 656 Pearsall (South). 489 Wharton.
499 Davenport (So.) 655 Pyote (South). 830 Ysleta (So)
670 Encinal (South) 655 Sand Hills, (So).
633 Eddy. 830 San Elizario (So.)
* Aquilares, 50 3 Corpus Christi, or 30 2 Laredo.
* Aurora, 25 2 Ft. Worth.
* Benavides, 40 3 Corpus Christi, or Laredo.
* Bowie, 40 3 Fort Worth.
* D'hanis, 50 3 San Antonio.
* Eagle Pass Junction, 100 7 San Antonio.
* Henrietta, 25 1 Denison, Texas, or Dodge City, Ks.
* Hondo City, 50 3 San Antonio.
* Kountz, 30 2 Beaumont.
* Lacoste, 40 3 San Antonio.
* Los Angeles, 50 3 Corpus Christi, or 30 2 Laredo
* Pena, 40 3 Corpus Christi, or Laredo.
* Realitos, 40 3 Corpus Christi.
* Sabinal, 7 5 San Antonio.
* Salado, 40 3, Austin.
* San Diego, 40 3 Corpus Christi, or 50 3 Laredo.
* Village, 40 2 Beaumont.

UTAH.

575 Hot Springs.
* No Ogden 30 2 by telephone, Ogden.
* Plain City, 50 3 by telephone, Ogden.

VERMONT.

38 Congress Hall Sheldon. 27 Passumpsic.
Summer office. 31 Pompanoosuc.
38 Maquam Bay. 39 South Wallingford.
21 Miles Pond. Ok. St.
Johnsbury.

* East Arlington, 10 1 Arlington.
* E. Rupert, 15 2 Factory Point.
* Guilford, 10 0 by telephone, Brattleboro.
* Hartwellville, 20 1 by telephone, No. Adams, Mass.
* Jacksonville, 25 2 by telephone, No. Adams, Mass.
* North Stamford, 15 1 by telephone, No. Adams, Mass.
* Readsboro, 20 1 by telephone, No. Adams, Mass.
* Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
* Sadauga, 25 2 by telephone, No. Adams, Mass.
* Stamford, 15 1 by telephone, No. Adams, Mass.
* Weis, 15 2 Factory Point.
* West Arlington, 15 1 Arlington.
* West Dover, 25 0 by telephone, Brattleboro.
* Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

123 Afton. 142 Healing Springs 96 Bottoway C. H.
114 Appomattox. reopened. 95 Plains.
153 Backbone. 142 Hut Sprngs. 86 R. F. & P. Junc.
133 Bufords. reopened. 163 Roanoke.
68 Clifton Forge. 123 Milnes. 111 White Post.
114 Concord. 162 New River Depot. 96 Wilson's Depot.
* Indian Rock (N. M.) 40 3 Richmond.
* Lairds, (N. M.), 40 3 Richmond.
* Lee Hall, 30 2 Richmond.
* New Market, Nelson Co., (N. M.) 25 2 Richmond.
* Salisbury, (N. M.), 40 3 Richmond.
* Wilton (N. M.) 50 3 Richmond.
* Yorktown, 45 3 Richmond.

WASHINGTON TERRITORY.

784 Carbonado. 722 So. Texas. 784 White River.
774 Skagit city. 738 Tacheney

PROPOSALS FOR MISCELLANEOUS ARTICLES.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Monday, July 10th, 1882, for furnishing 6 months' supply of the following named articles:

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

- 3½ Gross BATTERY BRUSHES. To be like sample.
- 4 Dozen MARINE CLOCKS, 8 in.
- 25 Gross PORCELAIN KNOBS.
- 250 Rolls KERITE TAPE.
- 500 Rolls ELASTIC TAPE.
- 10 Gross "Horseshoe" PAPER CLIPS.
- 10 Gross BELL TOP MUCCLAGE BOTTLES with BRUSHES.
- 100 Boxes Nos. 2 and 3 PAPER FASTENERS. Magill's Round Head.

Samples can be seen at the office of the Superintendent of Supplies, and articles furnished on contract must be fully equal to sample. All deliveries subject to inspection and acceptance or rejection.

Bidders will please submit with bid a sample of article or articles proposed to be furnished, plainly marked with bidder's name and date of proposal.

Bidders will please name the price of each article separately.

Deliveries to be made as required; and bills to be paid between the 15th and 25th of each month following the deliveries.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the 1st day of August, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company may require the goods contracted for.

The right is reserved to reject any and all bids, or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Each bid must include delivery at our Supply Department or on board in New York, without charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR MISCELLANEOUS ARTICLES."

WM. HUNTER,
Supt. Supplies.

NEW YORK, June 18th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR BATTERY JARS AND CARBONS.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Monday, July 10th, 1882, for furnishing 6 months' supply of the following named articles:

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

- 2000 Doz. Battery Jars, 6x4, best quality, flint glass bottoms punctured, to be carefully packed and delivered as required.
- 300 Dozen Battery Jars 4½x4½ inside measurement—best quality flint glass, bottoms punctured, to be carefully packed and delivered as required.
- 3,700 Carbons, No. 2, 6x½ inches. Sample furnished and required. Delivered in lots of 500.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the first day of August, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company may require the goods contracted for.

Bills to be paid between the 15th and 25th of each month following the deliveries.

The right is reserved to reject any and all bids, or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond, with two (2) sureties, for the proper fulfillment of the contract.

Each bid must include delivery at the Supply Department, New York or Chicago, free of charge for freight, package and cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR BATTERY JARS AND CARBONS."

WM. HUNTER,
Supt. Supplies.

NEW YORK, June 20th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR LAG SCREWS AND WASHERS.

THE WESTERN UNION TELEGRAPH CO. invites proposals until 12 o'clock, noon, Monday, July 10th, 1882, for 6 months' supply of the following named articles:

(The quantities named are only estimates, and amounts required may be more or less than those given.)

- 100,000 Lag Screws, 7x¼ in. or sizes such as may be required, and equal number of Washers. To be made of the best refined iron, and delivered at Chicago as required.
- 75,000 Lag Screws, 7x¼ in. or such sizes as may be required, and equal number of Washers. To be made of the best refined iron, and delivered at New York as required.

Bids for Lag Screws and Washers to be by the pound.

Bidders will be required to furnish four samples of the lag screw which they propose to furnish, marked with name of bidder and date of proposal.

Bidders will please observe all the terms of these specifications and make their proposals strictly in accordance with the same.

It is understood that the contract made in accordance with these proposals shall be valid and binding from the 1st day of August, 1882, for 6 months, and that deliveries on account of it shall begin on that date, or as soon thereafter as the telegraph company may require the goods contracted for.

Bills to be paid between the 15th and 25th of the month following the delivery.

The right is reserved to reject any and all bids, or to accept any which may seem for the best interests of the Company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Each bid must include delivery at Supply Department, New York or Chicago, free of charge for freight, package and cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR LAG SCREWS AND WASHERS."

WM. HUNTER,
Supt. Supplies.

NEW YORK, June 18th, 1882.

A copy of these specifications must be attached to each bid.

PROPOSALS FOR ENVELOPES.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Monday, July 10th, 1882, for 6 months' supply of No. 5 Manilla Envelopes.

(The quantity named is only an estimate, and the amount required may be more or less than that given.)

Estimated quantity for six months 24,000,000. No. 5 Manilla Envelopes 3½ lbs. per thousand, all printed alike. To be delivered in packages of 500, with bands, packed in wooden boxes if necessary, in quantities as required.

Bidders must agree to commence the delivery of envelopes within twenty days after the award of contract and furnish five millions per month, if so many are required, and will please state additional price per thousand, at which they will furnish these envelopes with Office Address, or any other printing necessary, in lots of not less than one thousand.

All envelopes to be delivered at the Supply Department, or on board, in New York, and no charge to be made for freight, cartage or boxing. Two samples of envelopes proposed to be furnished, must in all cases accompany the proposals.

Bills to be paid monthly, between the 15th and 25th of the month following the deliveries.

The right is reserved to reject any and all bids or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Bidders may be present in person or by attorney, at the opening of the bids, should they so desire. Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR ENVELOPES."

WM. HUNTER,
Supt. Supplies.

NEW YORK, June 20th, 1882.

A copy of this specification must be attached to each bid.

PROPOSALS FOR HARDWARE.

THE WESTERN UNION TELEGRAPH COMPANY invite proposals until 12 o'clock, noon, Monday, July 10th, 1882, for furnishing 6 months' supply of the following named articles:

(The quantities given are only estimates, and the requirements may be greater or less than here stated.)

118 Doz. LONG HANDLED SHOVELS, Ames', All Steel. Round Point, No. 2, with 6 ft handles.

12 Doz. HAND SAWS. "Pease's" 20 inch, 8 points to inch, No. 35.

7 Doz. COLLINS' AXES—Handled. 4½ to 6 pound Heads.

25 Doz. HAMMOND'S SHINGLING HATCHETS, No. 4.

8 Doz. HAMMOND'S BROAD HATCHETS, Nos. 1, 2, and 4. Please give price for each kind. Proportion of each kind required cannot be exactly stated.

100 Telegraph CROW-BARS, 7 ft long, made from 1½ inch octagon cast steel, No. 2. Each bar to be guaranteed of material as represented.

Samples must be submitted plainly marked with bidder's name and date of proposal.

100 Kegs, "Anchor" Brand, CUT NAILS, 10d. to 60d. Delivered at Supply Department, New York.

200 Kegs, "Anchor" Brand, CUT NAILS, 10d. to 60d. Delivered at Supply Department, Chicago.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the first day of August, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Tel. Co. may require.

All goods are to be subject to strict inspection, and acceptance or rejection by an officer of the company.

Deliveries are to be made at the Supply Department, New York City or Chicago as required.

Bills to be paid between the 15th and 25th of the month following deliveries.

The right is reserved to reject any and all bids, or to accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond, with two (2) sureties, for the proper fulfillment of the contract.

Each bid must include delivery at our Supply Department, New York or Chicago, without charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR HARDWARE."

WM. HUNTER,
Supt. Supplies.

NEW YORK, June 18th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR OFFICE WIRE.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Wednesday, July 12th, 1882, for 6 months' supply of cotton covered office wire.

(The quantity named is only an estimate, and the requirements for the six months may be greater or less than here given.)

Estimated quantity required: 10,000 pounds. To be No. 16 B.W.G. (.065 inch diameter), the copper to be at least 90 per cent. purity. The wire will be insulated in two manners: One consisting of three separate coverings of paraffined cotton—the other consisting of a single covering of the same. The copper to be well centred, and the covering to be firm, free from flaws, and close; and in both cases, braided—not wrapped.

Samples of wire to be submitted with bid; and all wire furnished on account of contract to be subject to inspection and acceptance by an officer of the company.

The right is reserved to reject any and all bids, or to accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond, with two (2) sureties, for the proper fulfillment of the contract.

Deliveries on account of contract will begin on August 1st, 1882, or as soon thereafter as required.

Bills to be paid between the 15th and 25th of the month following the deliveries.

Each bid must include delivery at the Supply Department, in New York or Chicago, free of charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR OFFICE WIRE."

WM. HUNTER,
Supt. Supplies.

NEW YORK, June 20th, 1882.

A copy of this specification must accompany each bid.

PROPOSALS FOR MANIFOLD AND CARBON PAPER.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Wednesday, July 12th, 1882, for furnishing six months' supply of the following named articles

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

2,500 reams MANIFOLD PAPER, 10x15, in books. Reams 900 sheets, 10x15, when made up in books with covers must not weigh over 2½ pounds.

Samples furnished and required.

Deliveries on account of contract must be fully equal in quality to such samples. Delivered in lots of 50 reams or more at our Supply Department, in New York or Chicago.

3,000 Dozen Carbon Sheets, 1x1½ inches, Best quality. Samples furnished and required.

Paper delivered on account of contract must be fully equal to samples. Sheets must be of bright lasting color, and moist; but not to the extent of discoloring the manifold paper by mere contact. To be put up in packages of one dozen, interleaved, and have a sheet between each dozen; and each package to be covered, on delivery, with stout card-board, in lots of fifty dozen. Manifold Paper and Carbon to be delivered half size, namely: 7½x10 inches, when required, put up in same manner as office size, and delivered without extra charge for cutting.

It is understood that contracts made in accordance with these proposals shall be valid and binding from the first day of August, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company may require the goods contracted for.

Bills to be paid between the 15th and 25th of the month following the delivery.

The right is reserved to reject any and all bids, or to accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond, with two sureties, for the proper fulfillment of the contract.

Each bid must include the delivery at the Supply Department, in New York or Chicago, free of charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR MANIFOLD AND CARBON PAPER"

WM. HUNTER,
Supt. Supplies.

New York, June 20th, 1882.

A copy of this specification must accompany each bid.

PROPOSALS FOR MISCELLANEOUS PAPER.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Wednesday, July 12th 1882, for furnishing 6 months' supply of the following named articles:

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

4,000 REAMS MANILLA COPYING PAPER, 21x32 inches, 15 pounds to 500 sheets, unsized, and equal in all respects to sample furnished. Sample required. Name price per pound for cutting up in sheets 5½x8 inches. Put up in packages of 1,000 sheets, with strong manilla wrappers. Delivered at Supply Department, New York, in lots of 100 reams, or more, as may be required. The contractor must keep on hand at all times ready for delivery, not less than 600 reams.

54,000 pounds WHITE MESSAGE PAPER, cut 5½ x 8 inches, and 8 x 10½ inches. Samples furnished and required, and paper delivered on account of contract to be in all respects equal to such samples. Put up in packages of 1,000 sheets, with strong manilla wrappers. Delivered at Supply Department, Chicago, in lots 1,000 to 1,500 lbs.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the 1st day of August, 1882, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company may require the goods contracted for.

Bills to be paid between the 15th and 25th of the month following the deliveries.

The right is reserved to reject any and all bids or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Each bid must include delivery at our Supply Department New York or Chicago, without charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR MISCELLANEOUS PAPER."

WM. HUNTER,
Supt. Supplies.

New York, June 18th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR INK.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock noon, Wednesday, July 12th, 1882, for furnishing 6 months' supply of ink.

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

100 Gallons Machine Copying Ink, in bulk. Samples required. Delivery as required.

20 Gro. Combined W. and Copying Fluid, quarts. Sample required. Delivered as required, in lots of one gross.

20 Gro. Combined W. and Copying Fluid, pints. Delivered in lots of one gross, or more, as required.

5 Gro. Combined W. and Copying Fluid, half-pints. Delivered as required, in lots of one gross, or more.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the first day of August, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Co may require the goods contracted for.

Bills to be paid between the 15th and 25th of each month following the deliveries.

The right is reserved to reject any and all bids, or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Each bid must include delivery at our Supply Department, New York or Chicago, and no charge to be made for freight, cartage or package.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR INK."

WM. HUNTER,
Supt. Supplies.

New York, June 20th, 1882.

A copy of these specifications must accompany each bid.

Just published. The new text-book,

COMMERCIAL & RAILWAY TELEGRAPHY In Theory and Practice.

Arranged in questions and answers, 112 pages, 32 sections, illustrated; compiled and prepared by J. P. ABERNETHY, Supt. Telegraph. Illustrated. Boards, 75 cents. Cloth, \$1.00.

CONTENTS.

PART I. Instruction for beginners in manipulation and reading by sound.—Setting up instruments for learners to practice.

PART II. Electricity.—Electricity in general—Conductors' insulation and induction—Atmospheric electricity—Frictional electricity—Voltaic electricity, and Batteries for exciting it—Magnetism.

PART III. The Telegraph.—Relation of circuits and instruments—The line or main circuit—The local circuit—The key—Relay, Register and Sounder, and box relay, or main line sounder—Adjustment and care of instruments—The repeater—Duplex and quad duplex systems—Switches—Switchboards—Ground wires and lightning arresters—The galvanometer—Resistance coils—Rheostat—Condenser—Voltmeter, and the Wheatstone's bridge—Telegraphic interruptions and the means of locating same—The telephone—Submarine telegraphy—The Atlantic cables, how worked, etc., etc.

PART IV. Management of Commercial Offices.—Transmitting messages—Receiving and delivery of messages—Press reports—Weather report U.S. Signal Service—Money orders by telegraph—The telegraph in Wall Street, New York—The "ticker"—Telegraphic bookkeeping and monthly reports.

PART V. Railway Telegraphy.—Management of railway offices—Train dispatchers' and operators' duties—Circuit regulations, etc.—Classification of trains—Train reports—Car reports—Time by telegraph—Railway signals—Numerals and abbreviations—Train orders, different forms of, etc., etc.—Block system, Pennsylvania R. R.—Station Agents' and station employees' duties—Freight department—Passenger or ticket department—Baggage department—Express—Railway station bookkeeping and accounts.

Price, 75 cents, or 3 copies \$2; cloth, \$1 each. Sent, post-paid, on receipt of price. Address

W. J. JOHNSTON,

No. 9 Murray St., New York.

J. P. ABERNETHY, Supt. Tel.,
Cleveland, O.

JUST PUBLISHED!

The United States Military Telegraph DURING THE CIVIL WAR.

BY W. R. PLUM.

2 Vols., Cloth. Price of both volumes, \$5.

This important work, just ready, the preparation of which has occupied Mr. Plum for the past FIVE YEARS, and which has been looked forward to with so much interest by all classes of telegraphers, can now be ordered of the undersigned, and will be forwarded, ALL CHARGES PREPAID, on receipt of price, \$5 00.

The very large number of telegraphers all over the country who have been looking for this announcement for so long, can now send in their orders at once.

The book is in two large handsome and substantially bound volumes, printed on thick, smooth paper. There is scarcely an operator in the business to-day who will not recognize some of his friends in it. At the end of volume II, the names of all connected with the military service during the war are printed complete. There are also portraits of Andrew Carnegie, David Strouse, J. J. S. Wilson, G. H. Smith, T. B. A. David, S. G. Lynch, J. C. Van Duzer, J. R. Gilmore, W. G. Fuller, W. L. Gross, R. C. Clowry and Samuel Bruch, officers of the U. S. M. T. Corps, besides a full page engraving of Gen. Stager, as a frontispiece to volume I, and a like engraving of Gen. Eckert, as a frontispiece to volume II.

The Confederates come in for a good share of attention, and they figure in many of the incidents. The entire work is really an excellent story of the civil war, the maps, of which there are eight, helping to make the narrative clearer to the reader.

Every Telegrapher should have a copy
in his Library.

Some of W. J. Johnston's Other Books.

WIRED LOVE. A Romance of Dots and Dashes. By Ella Cheever Thayer. An exceedingly interesting, amusing and popular work, and the only telegraphic novel published. Every telegrapher should read it. "A good book to make you forget business and cares and leaves pleasant memories behind it."—*Inter-Ocean*. 256 pp. cloth 75c.

SAM JOHNSON. The Experience and Observations of a Railroad Telegraph Operator. By J. Albert Clippinger, author of "The Pedagogy of Widow's Club," "Samson Papers," etc. "One of the most entertaining books in the whole library of Railway Literature."—*Railroader*. 75c.; cloth, \$1. COMMERCIAL AND RAILWAY TELEGRAPHY. In theory and practice. Compiled and prepared by J. P. Abernethy, Supt. Telegraph. 112 pages. Boards 75 cents. Cloth \$1. TELEGRAPHIC TALES AND TELEGRAPHIC HISTORY. A popular account of the Electric Telegraph, its uses, extent and outgrowth. By W. J. Johnston, Editor of THE OPERATOR. "It is seldom that a book containing so much substantial and not easily accessible material of a specific kind is commended to a wide audience by a careful and pleasing literary treatment."—*New York Sun*. Second Edition, revised and enlarged. 286 pages, cloth \$1.

THE AMERICAN POPULAR DICTIONARY. A Perfect Library of Reference in one handy volume, containing every useful word to be found in the English language, with its true meaning, derivation, spelling and pronunciation. This work has already met with an immense sale, and everywhere gives satisfaction. 510 pp. cloth \$1.

Any of the above, or any other book, newspaper, or magazine published, scientific or popular, telegraphic or non-telegraphic, forwarded, POSTAGE PREPAID on receipt of price. "Tales and History," "Wired Love," and "Oakum Pickings" will be mailed together, all bound in cloth and uniform in size, for \$2.00.

THE CIRCULATION OF

THE OPERATOR

HAS ALMOST DOUBLED DURING THE PAST YEAR, and subscribers all say they COULD NOT NOW GET ALONG WITHOUT IT. There are doubtless thousands more who would have a similar experience. To induce them to give the paper A FAIR TRIAL, we will send it to them from

June 1st until Dec 15th 1882,

or fourteen numbers on receipt of

FIFTY CENTS.

U. S. Postage stamps taken. Order at once.

For \$1.00 we will send the numbers from January 1st complete for the whole year.

To any one sending us a club of FOUR 50c. subscriptions as above we will send one extra copy free.

Remit by Post-office order, draft, registered letter or express. U. S. Postage stamps taken. Address

W. J. JOHNSTON Publisher,
No. 9 Murray Street, New York.

A GREAT OFFER.

To Superintendents. Managers, Purchasing Agents
and others having on hand

Worn Out, Damaged or Useless Morse Keys,

We will, until further notice, furnish our

New Steel Lever Keys

in exchange for all old keys for a cash difference of \$1.66 each. This price applies to any number of keys, no matter in what condition the old ones may be. They must be delivered to us, in packages plainly marked **KEYS**, with all charges **PREPAID**, and remittance should accompany the orders, except from Superintendents and Purchasing Agents of well-known Companies.

Now is the time, while the offer holds good, to get together all of your

Used-up and "Bad" Keys

and exchange them for splendid New Ones. See description and advertisement of Steel Lever Key. Send for circular.

J. H. BUNNELL & CO.,

112 Liberty Street, N. Y.

FREE!

Complete Instruction in Telegraphy

If you wish to know all about learning Telegraphy, constructing and operating Short Lines of Telegraph, &c., send your address, by postal card or letter, and get J. H. Bunnell & Co.'s Manual of Instruction for Learners of Telegraphy, latest edition, which we will send

FREE OF CHARGE,

to all who apply, by mail or otherwise.

It is the plainest and best book of instruction in Telegraphy ever published, being fully complete in description, explanation and illustrations.

J. H. Bunnell & Co.,

112 Liberty Street, N. Y.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

2,229 MEMBERS. \$23,000 RESERVE FUND.

Invites attention to its success, having paid its beneficiaries over \$185,000, and accumulated a reserve fund of \$73,000. No officer or agent draws salary or commission. Average annual assessments to each member less than \$12.

Any person, of either sex, in good health of not less than 18 or more than 45 years of age, employed in telegraph or telephone service, is eligible to membership; and should a member in good standing leave the service, but continue to pay all dues and otherwise conform to the Constitution and By-Laws, he can retain his membership.

Initiation fee \$2. Insurance \$1,000. Any one who is or becomes a member in good standing of this Association is also eligible to membership in the Second Division. For further information, copies of Constitution and By-Laws, blank applications, etc., apply to any of the following named officers or agents:

OFFICERS:

CLARENCE GARY, President. O. H. SUMMER, Vice-President.
A. R. BREWER, Secretary. SAMUEL M. TAYLOR, Treasurer.

EXECUTIVE COMMITTEE:

CLARENCE GARY, New York. O. H. SUMMER, Chicago, Ill.
A. R. BREWER, New York. SAMUEL M. TAYLOR, New York.
W. H. YOUNG, Washington, D. C. F. W. JONES, New York.
JOHN E. ZEUSLIN, Phil. Pa. CHARLES S. H. SMALL, New York.
JAMES MERRIMAN, New York.

AUDITING COMMITTEE:

H. C. BOSCHER, Philadelphia, Pa. T. P. SOULLY, New York.
E. W. FURN, New York.

AGENTS:

| | |
|---|---------------------|
| Albany, N. Y. | Charles O. King. |
| Augusta, Ga. | John W. Brown. |
| Atlanta, Ga. | J. M. Stephens. |
| Baltimore, Md. | R. J. Bloxham. |
| Bangor, Me. | O. E. Bliss. |
| Bismarck, Dak. | Chas. E. V. Draper. |
| Boston, Mass. | E. B. Pillsbury. |
| Buffalo, N. Y. | J. W. Tillinghast. |
| Cheyenne, Wyo. | Chas. F. Annett. |
| Cincinnati, Ohio. | G. W. Sheppard. |
| Chattanooga, Tenn. | Charles H. Skelton. |
| Charleston, S. C. | J. D. Easterlin. |
| Chicago, Ill. | J. Uhrig. |
| Cleveland, Ohio. | M. L. Melton. |
| Columbus, Ohio. | A. M. Paddock. |
| Denver, Col. | W. B. Bandie. |
| Dubuque, Iowa. | J. L. Benson. |
| Detroit, Mich. | T. W. Hill. |
| Evansville, Ind. | N. M. Booth. |
| Fort Benton, Mont. | A. B. Keeler. |
| Grand Rapids, Mich. | E. D. Benedict. |
| Galveston, Texas. | David Hall. |
| Grafton, W. Va. | A. T. Oline. |
| Harrisburg, Pa. | H. A. Gint. |
| Halifax, N. S. | Alex. E. Hoyt. |
| Hartford, Conn. | S. B. Curtis. |
| Indianapolis, Ind. | F. A. Moore. |
| Jackson, Mich. | D. S. Fleming. |
| Jackson, Tenn. | Nelson E. Jacobs. |
| Kansas City, Mo. | M. D. Wood. |
| La Fayette, Ind. | H. R. Doolittle. |
| La Porte, Ind. | H. C. Noe. |
| Little Rock, Ark. | A. C. Newton. |
| Louisville, Ky. | Charles Smith. |
| Metropolitan Tel. & Tel. Co., N. Y. | W. G. Good. |
| Mobile, Ala. | B. P. Shreve. |
| Montgomery, Ala. | E. Winter. |
| Memphis, Tenn. | H. E. Conley. |
| Milwaukee, Wis. | D. H. Henshaw. |
| Montreal, Quebec. | James Kent. |
| Nashville, Tenn. | A. H. Stewart. |
| New Haven, Conn. | J. M. Fairchild. |
| New Orleans, La. | J. T. Allyn. |
| No. Sydney, C. B. | Math'l Martell. |
| New London, Conn. | G. W. Russell. |
| N. Y. L. Erie & W. B. R. (21 Cortlandt St. N. Y.) | O. D. Reed. |
| Oil City, Pa. | Frank Ross. |
| Omaha, Neb. | J. M. Rheam. |
| Pacific Telephone Co., San Francisco. | J. I. Sabin. |
| Philadelphia, Pa. | Wm. G. Jones. |
| Phillipsburgh, N. J. | G. H. Grace. |
| Peoria, Ill. | J. B. Hammatt. |
| Pensacola, Fla. | O. L. Le Baron. |
| Pittsburgh, Pa. | J. E. Palmer. |
| Poughkeepsie, N. Y. | S. K. Runkley. |
| Portland, Me. | C. D. Livermore. |
| Portland, Oregon. | F. H. Lamb. |
| Providence, R. I. | Jas. S. Hall. |
| Reading, Pa. | W. H. Kunyon. |
| Richmond, Va. | W. O. Walstrom. |
| Rochester, N. Y. | A. J. Stoddard. |
| Sano, Nevada. | Frank H. Macdonell. |
| Sayre, Pa. | E. H. Hamilton. |
| Scranston, Pa. | E. O'Brien. |
| Syracuse, N. Y. | Luther G. Field. |
| St. John, N. B. | R. T. Clinch. |
| St. Louis, Mo. | Geo. W. Brownson. |
| St. Paul, Minn. | Geo. B. Evans. |
| San Francisco, Cal. | A. P. Dubois. |
| Savannah, Ga. | H. Griffith. |
| Springfield, Mass. | W. J. Denver. |
| Springfield, Ill. | W. W. Kelchre. |
| Toronto, Ont. | J. Farwell. |
| Troy, N. Y. | J. W. Spencer. |
| Toledo, Ohio. | E. W. Fish. |
| Vincennes, Ind. | Ferry Hood. |
| Washington, D. C. | W. H. Young. |
| Wheeling, W. Va. | Jno. G. Tomlinson. |
| White River Junction, Vt. | G. W. Gates. |
| Wellsville, Ohio. | F. Bruner. |
| Worcester, Mass. | E. W. Bradford. |
| Watertown, N. Y. | D. Van Nostrand. |

A. R. BREWER, Sec'y.

P. O. Box 3175, New York.
W. U. T. BUILDING, Room 53.

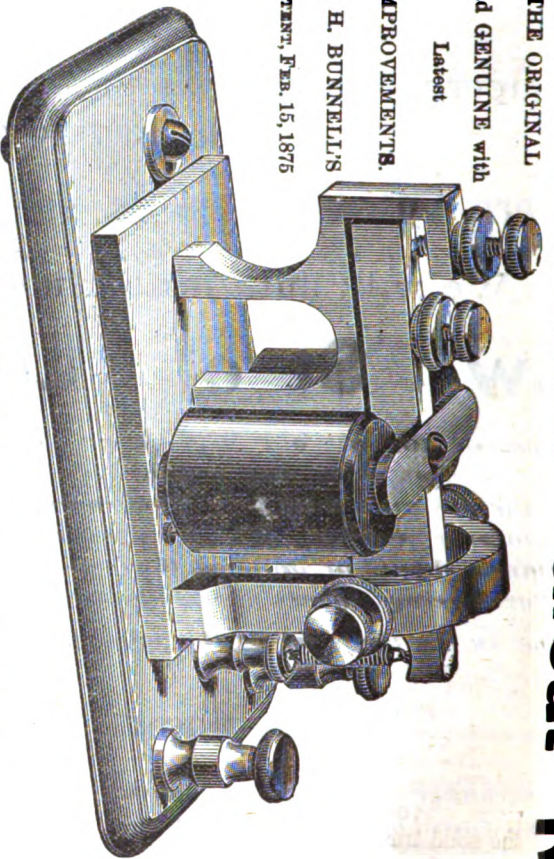
Another Great Reduction in Prices !

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS.

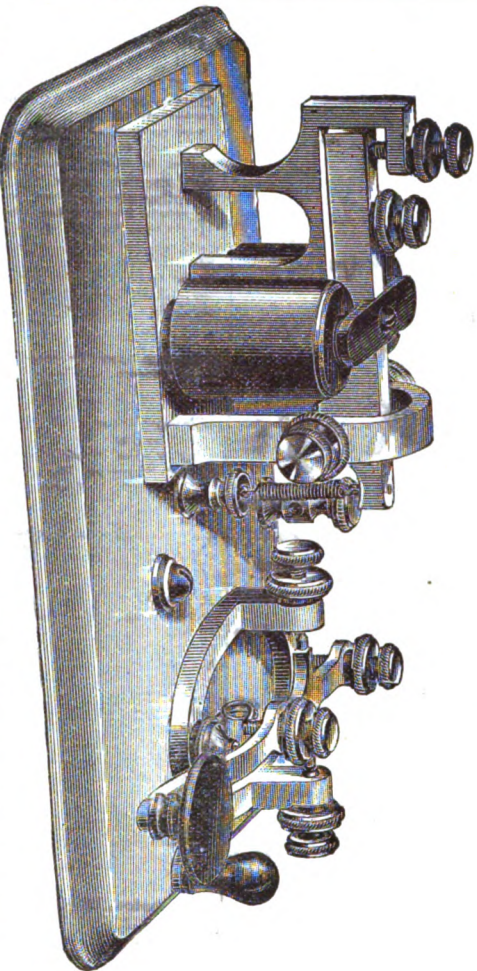
J. H. BUNNELL'S

PATENT, FEB. 15, 1875



THE GIANT SOUNDER—UNEQUALLED ! \$4.00.

— We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$4.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

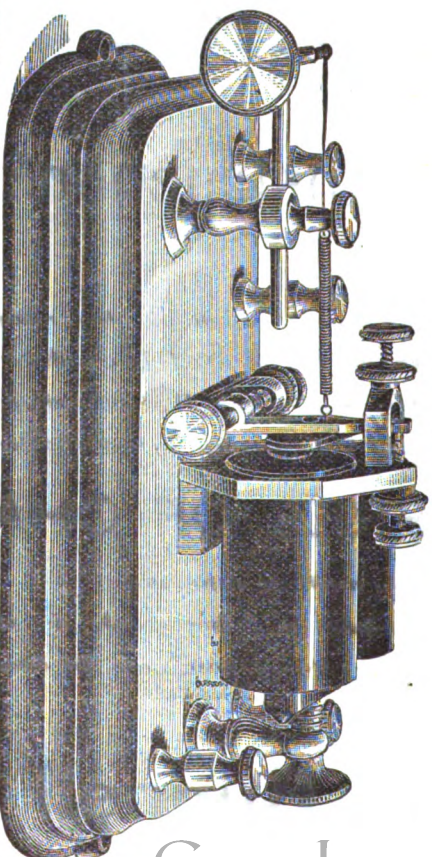
COMBINATION SET : \$7.50.

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$7.50, carefully boxed and sent by mail, prepaid, to any part of the United States.

All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 113 LIBERTY STREET, N. Y.

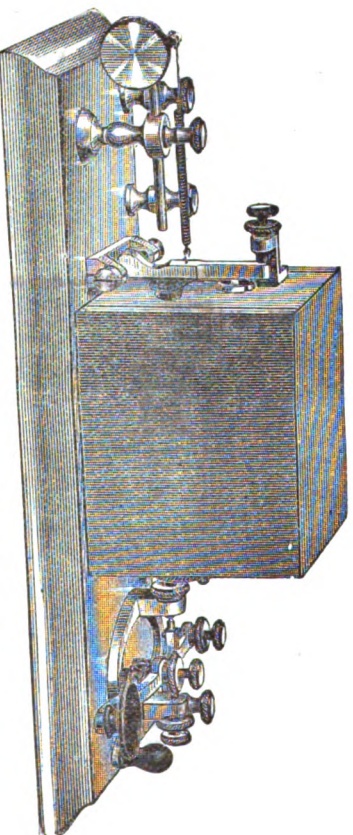
\$7.50.



FIRST CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Surbase, Extension Adjustment. Price, \$7.50. }

\$11.00.



BOX SOUNDING RELAY AND STEEL LEVER KEY.

COMBINATION SET.

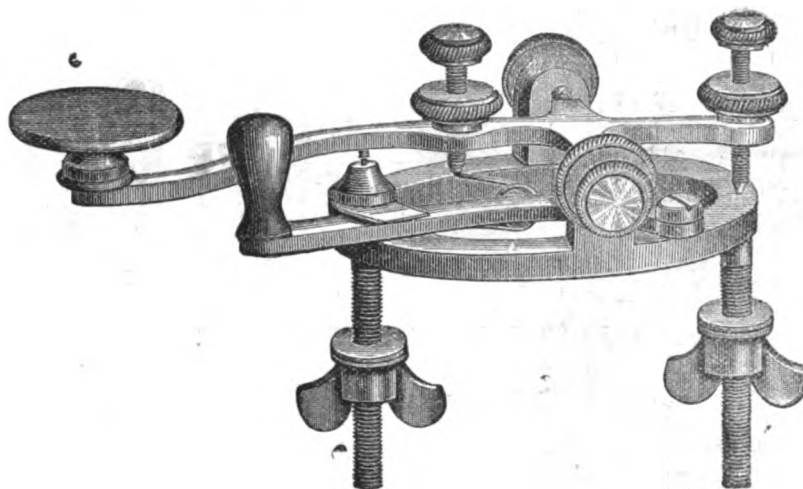
For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire.

Price, with Steel Lever Key on base, \$11.00; without Key, \$8.50.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:


The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Our Steel Lever Solid Trunnion Key

is now well known throughout the United States and Canadas as being the most satisfactory, durable and perfect key for Morse Telegraphing.

Its great popularity since its first introduction has caused many attempts to produce a key having at least equal merit. But, after two years' trial in thousands of different places, it still remains

“A Number 1,” Ahead of all,

while its competitors drop out and cease to be heard from.

Various absurd contrivances will, no doubt, continue to be put forward as being equal or better keys, but we would say to all who wish to possess a perfect instrument that

“The Bunnell Steel Lever Key”

is beyond all comparison,

THE BEST.

J. H. BUNNELL & CO.,

FIRST-CLASS TELEGRAPH INSTRUMENTS & MATERIALS OF EVERY DESCRIPTION,

112 Liberty Street, New York,

CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells,
District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS.

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

GEO. WESTINGHOUSE, JR. Pres. RAUL H. BASILEY, V. Pres. & Treas.
O. H. JACKSON, Gen'l Manager. ASAPH T. ROWAND, Secretary.
HENRY SNYDER, General Agent.

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.

sole Owners and Manufacturers of the only practically successful

SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches,
Signals and Gates by Levers, Hydraulics, Pneumatics or Electricity.

Also, Manufacturers of Frogs, Crossings, Switches and Switch
stands.

Plans estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnished upon application

ESTABLISHED 1820.

ALFRED F. MOORE,

[Successor of JOSEPH MOORE & SONS]

MANUFACTURERS OF

INSULATED TELEGRAPH WIRES,

201 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

INSTRUMENT AND OFFICE WIRES. FLEXIBLE CORDS. ANNUNCIATOR

AND BURGOLAR ALARM WIRE. ELEVATOR CABLES.

All wire used is thoroughly tested for conductivity, therefore
ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP

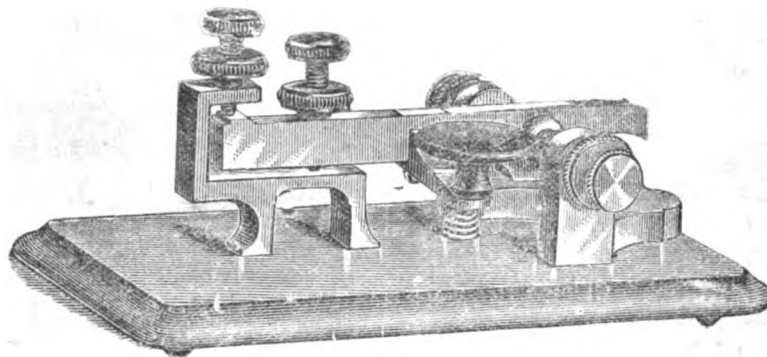
FOR FLEXIBLE CORDS

Descriptive Circulars furnished upon application

NEW MECHANICAL

TELEGRAPH INSTRUMENT.

PATENTED APRIL 4, 1882.



COMBINED KEY AND SOUNDER.

No BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is *always ready for use.*

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or registered letter.

J. H. BUNNELL & CO.,

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE.

**ILLUSTRATED CATALOGUES
OF MAY, 1882?**

If not, send your address by postal card or letter and you will get one by return mail

It contains Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instruments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

Don't Read This!
Or you will BE SURE to send for our NEW 1882 CATALOGUE, which is proper and to your interest to do before purchasing elsewhere. IF you want to be a TELEGRAPH OPERATOR send twenty-five cents for our NEW 1882 ILLUSTRATED INSTRUCTION BOOK. It is the MOST COMPLETE instruction book in the world. It is worth five times what it cost. If a person could not learn to be an operator after studying it, they had better give up. Yours truly, A. L. JAMES, Tipton, Tulare County, Cal.
Now! Right Now! while fresh in your mind, is the best time to send your order, before you misplace this paper and forget our address, and your opportunity is gone. Remittances preferred in currency, 1c. or 2c. stamps.
C. E. JONES & BRO.,
MANUFACTURERS AND DEALERS IN
TELEGRAPH, TELEPHONE AND ELECTRICAL SUPPLIES.
NO. 51 WEST FOURTH STREET, CINCINNATI, OHIO.

WESTERN ELECTRIC MANUFACTURING COMPANY.

220-222 KIRKIN STREET, CHICAGO.

62-68 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF
TELEGRAPH INSTRUMENTS AND SUPPLIES.

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANNON STAGER, President. ERIC M. BARTON, V.-Pres.

ELLEN A. GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE. |
|---|--------|--------|
| I—Complete Set of Catalogues..... | 256 | 20c. |
| II—Telegraph Instruments and Supplies | 64 | 6c. |
| IV—Insulated Wire (included in II) | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 32 | 3c. |
| VI—Electro-Medical Apparatus..... | 32 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 32 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 3c. |
| XI—Magnets for Mills..... | 20 | 3c. |
| Str Wm. Thomson's Nautical Instruments... | 24 | 6c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,

AND

PLAIN AND OILED WIRE OF SUPERIOR QUALITY,

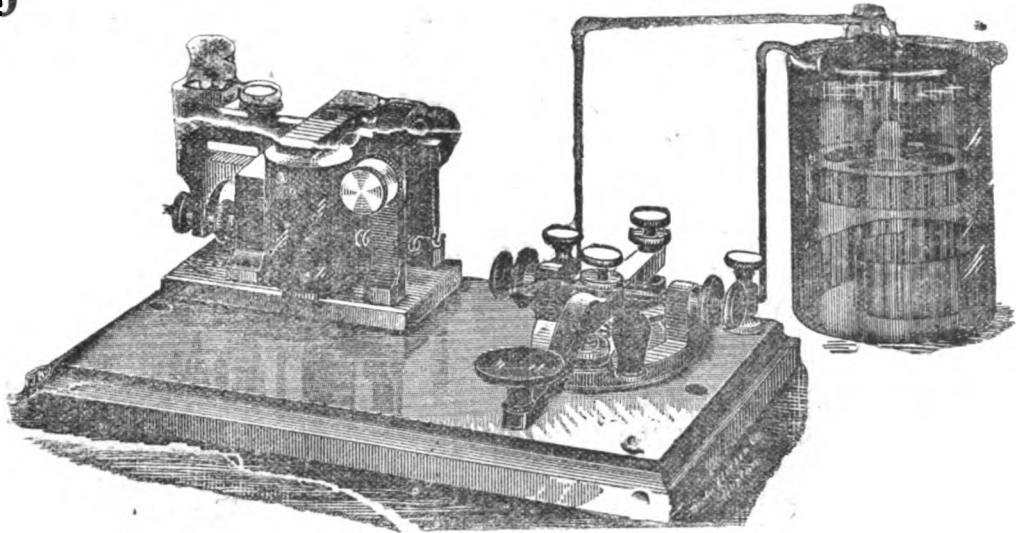
FROM SWEDISH CHARCOAL AND B B IRON.

BUT ONE JOINT PER BUNDLE.

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



PRICE FOR THE COMPLETE "GEM" LEARNERS' OUTFIT, \$4.20.

Consisting of the above large-sized Sounder and Key, a good Cell of Callaud Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instruments made that has nicely finished brass Sounder and Key Levers with perfect adjustments for both.*

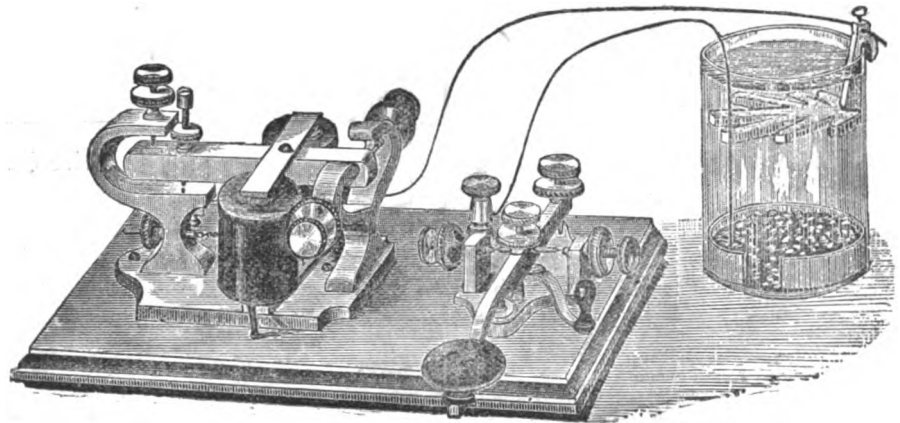
| | | | | |
|---|--------|-----------------------------|-----------------|--------|
| Price for Complete Outfit..... | \$4.20 | Price for Instrument alone, | 1 to 15 miles.. | \$4.00 |
| " " Instrument alone | 3.40 | " " " " " " | " " | " |
| " " Instrument alone, by mail, postpaid ... | 4.00 | by mail, postpaid..... | | 4.5 |

SEND FOR CIRCULAR.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,

No. 30 HANOVER STREET, BOSTON, MASS.



No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of Sounder, Key, either on 1 base or separate, 5x7, Callaud Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent C. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

A. B. LYMAN, 36 South Water St., Cleveland, O.

PARTRICK & CARTER

TELEGRAPHIC SPECIALTIES.

THE GIANT SOUNDER PERFECTED.

Patented Feb. 16, 1875. Most perfect, reliable, clear toned; fine finish, and warranted the best working sounder in existence. Price, by mail, \$5.00.

THE "LATTIG" AUXILIARY LEVER NON-STICKING KEY.

PATENTED AUGUST 16, 1881. PRICE, \$5.00, BY MAIL.

This Key is very fine finish nickel-plated, and presents a beautiful appearance, is easy to handle and WARRANTED NEVER TO STICK. It has been extensively tried and has received the endorsement of the best operators in the country. It embodies the only true principle to prevent a Key from sticking by having a great separation between the anvil and hammer, without increasing the play of the Key lever, thereby preventing the formation of the "Electrical Arc" between the platina points, which is the PRIMARY CAUSE OF STICKING KEYS. We claim this Key will never fail to make contact.

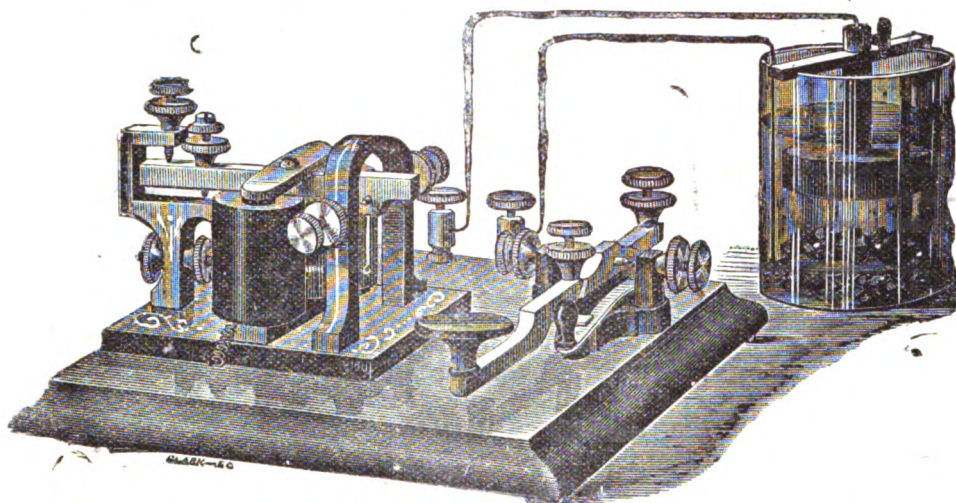
"THE EXCELSIOR KEY."

(PATENT APPLIED FOR.) PRICE \$2.50 BY MAIL.

This Key is made ENTIRELY OF BRASS NICKEL PLATED, with hardened platina points, and it is put forward to meet the long existing demand for a CHEAP, LIGHT, EASY WORKING, FIRST CLASS KEY, and is without doubt the CHEAPEST and BEST Key EVER OFFERED FOR THE MONEY.

Premium Learners' Apparatus.

Only \$5.00. Not the Cheapest, but Guaranteed the Best.



The PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER, PERFECTED," and "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Galland Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5.00, when the money accompanies the order. The great number of these Instruments use is the best testimonial that can be offered.

| | |
|---|--------------------------|
| Price, Complete Outfit | Money in advance, \$5 00 |
| " Instrument without Battery | " " 4.20 |
| " Instrument without Battery, by Mail | " " 4.75 |

Remittances should be made by P. O. Money Order, Registered Letter, Draft or Express, which will insure safe delivery. Send for circulars.

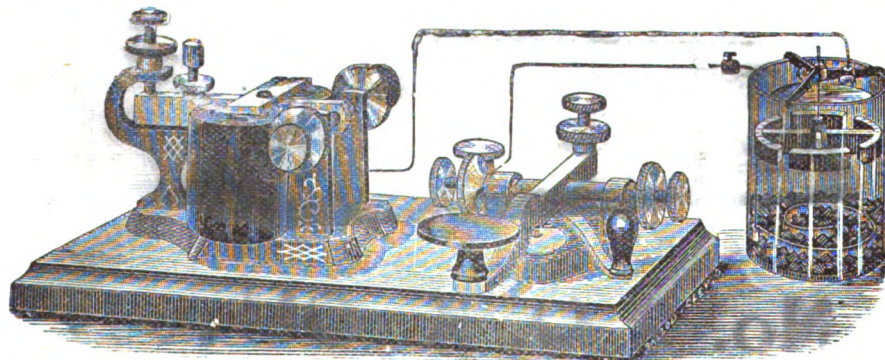
PARTRICK & CARTER,
No. 114 SOUTH SECOND STREET, PHILADELPHIA, PA.,

Manufacturers and Dealers in TELEGRAPH, TELEPHONE, AND ELECTRICAL INSTRUMENTS AND SUPPLIES OF EVERY DESCRIPTION. Send for Catalogues and Circulars.

SEND FOR OUR PRICES BEFORE PURCHASING ELSEWHERE.

EUREKA OUTFIT NO. 2.

Price \$4.00.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK

SENT ON RECEIPT OF \$4.00; OR SENT C. O. D. \$3.00 IF \$1.00 IS SENT WITH THE ORDER.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

144 Superior Street, Cleveland.

WESTERN

SCHOOL OF TELEGRAPHY.

JANESVILLE, WISCONSIN.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement, now of eight years standing, with the system of city lines in Chicago known as the Metropolitan Telegraph Company, having over 100 offices, and worked in connection with the Western Union Telegraph Company. These city lines draw their operators from this school, placing them first in sending offices and afterwards promoting them according to merit. The superintendents of telegraph of the different railroads centering at Chicago, employ many men from the city lines, and the Western Union Company does the same, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make of our students first class operators, nor to obtain for them first class situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

RICHARD VALENTINE, } MANAGER
A. M. VALENTINE, }

N. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have lately furnished the following Companies in this way: Wisconsin Central, Green Bay & Minn.; St. Paul, Minneapolis, & Manitoba; Chicago, St. Paul, Minneapolis & Omaha and Burlington & Northwestern.

We can also furnish, on short notice, experienced operators competent to manage any ordinary office, and reliable in every respect.

CEDAR TELEGRAPH POLES,

50,000 for SALE, by

H. G. RIPLEY,

East Saginaw, Mich.

Operators' Cramps cured by



LITTLE GIANT FRENCH BATTERY

Relieves Rheumatism and all Nervous Complaints. Supersedes all others. Send for circular.
C. E. JONES & BRO.
Cincinnati, Ohio.

THE

BROOK'S PATENT INSULATORS

WERE AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1867.

At the Vienna Exposition, 1873.

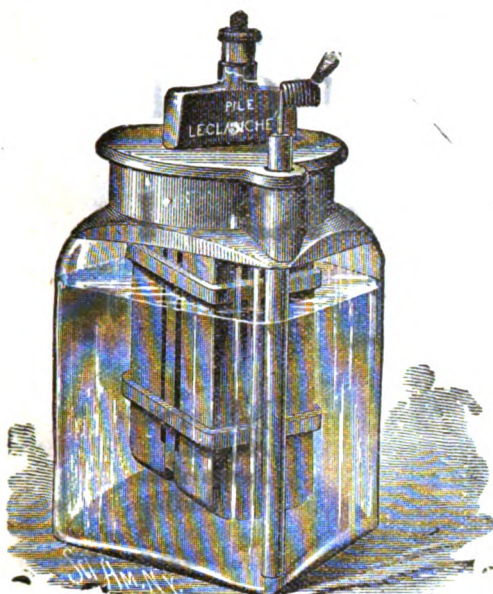
At the Cincinnati Industrial Exposition in 1874.

And at the Centennial Exposition at Philadelphia in 1876.

MANUFACTURED AND FOR SALE BY

DAVID BROOKS,

22 South 21st Street, Philadelphia.

LECLANCHÉ BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company,
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones,

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Plates or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of IMITATIONS and WORTHLESS IMITATIONS.

Every genuine Leclanché Battery has the words *Pile Leclanché* stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity
Sine and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,

149 West 18th St., New York.

Or L. G. TILLOTSON & CO.,

5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FIBERED

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLES, ETC.

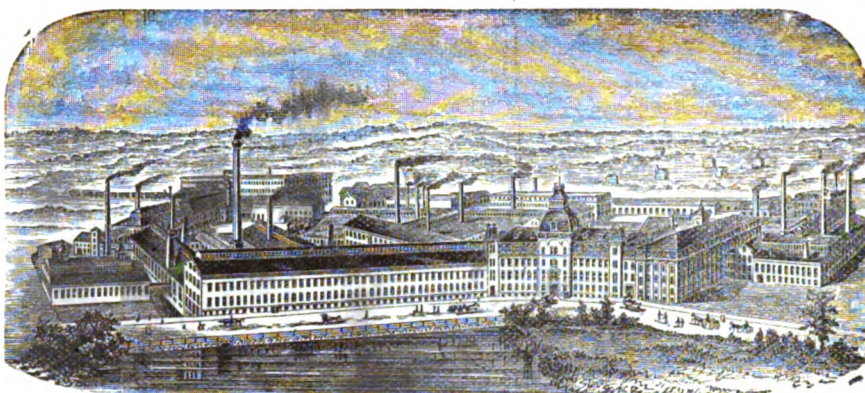
OFFICE AND FACTORY: 67 STEWART STREET,

PROVIDENCE, R. I.

W. H. SAWYER, Electrician and Sup't,

TELEGRAPH WIRE.**WASHBURN & MOEN MANUFACTURING COMPANY.**

ESTABLISHED 1861. CAPITAL \$1,600,000.

**WORCESTER, MASS.**

21 CLIFF STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequaled in that particular.

Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

(In connection with the DOUBLE SIEMENS FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

KERITE INSULATED**TELEGRAPH WIRES AND CABLES**

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession

THE

DURABLE QUALITIES OF KERITE

RECOMMENDED BY AS THE

CHEAPEST AND MOST ECONOMICAL

insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation furnished at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

B. HATCHER, General Agent.

TELEPHONE WIRE**THE AMERICAN
BELL TELEPHONE COMPANY.**

W. H. FORBES, President, W. K. DRIVER, Treasurer,

THEO. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

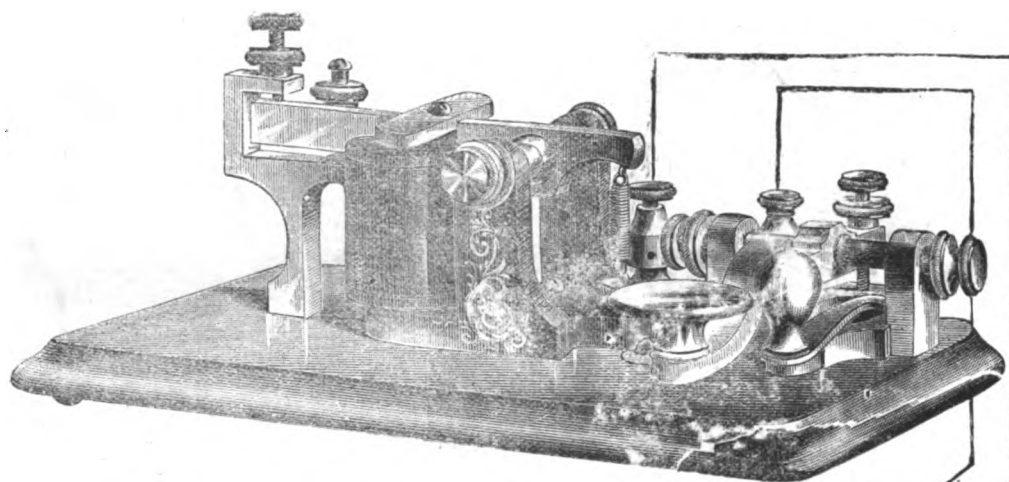
We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

The "Morse" Learners' Outfit \$3.75.

**GREAT
REDUCTION
IN
PRICE!!
THE BEST.**



THE BEST.

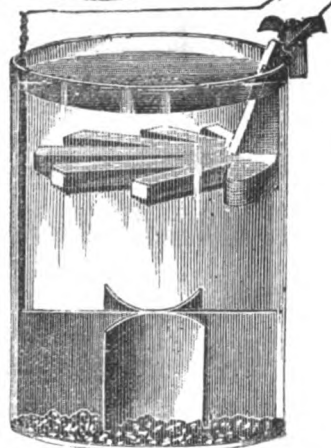
Price, \$3.75, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.
 "Morse" instrument alone, without battery..... \$3.00
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 3.75
 Cell of battery complete..... .65
 "Morse" Learners' Instrument, without battery, sent by mail..... 3.50
 (Battery cannot be sent by mail.)

Instruction Book FREE.

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



The "Morse"

Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners' Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

**You are SURE of getting
THE BEST THAT IS MADE
IF YOU SELECT THE "MORSE"**

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.

SHORTHAND Writing thoroughly taught by mail or personally. Situations procured for pupils when competent. Send for circular. W. G. CHAFFEE, Oswego, N.Y.

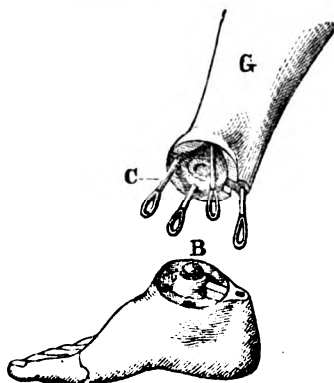
I will teach any operator the Corresponding Style of Phonography, who will sell a Caligraph for me.



YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "73," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 73 either designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys, Sounders, Belays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents; 25 for 25 cents. Samples of Operators' Cards, 10 cents. 50 New and laughable Illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 New and rich Transparent Picture Cards, with your name, 25 cents. 25 Tinted Portraits of Actors, 25 cents. 25 Sub-spitting Comic Cards, 25c. Morocco card cases, two pockets, 10c. 100 finely printed letter heads, \$1.00. 100 extra No. 6 envelopes, printed to order for \$1.00. Wedding Invitations, printed in fine style, 50 for \$2.00, samples, 10c. Agents Wanted to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also satin fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and Flipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200, no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from 3 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,

F. P. MUNN, CLYDE, Wayne Co., N. Y.



THE CELEBRATED BLY

ARTIFICIAL LIMBS. With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet. GEO. R. FULLER, Successor to Dr. D. BLY, Rochester, N. Y.

BEST TELEPHONE EXCHANGE SWITCH BOARD.

IN THE WORLD.

SUPERSEDING ALL OTHERS.

Sample and Circulars sent to Exchanges on Application to

C. E. JONES & BRO.,
CINCINNATI, OHIO.

Cornell University.

Departments of

Civil Engineering,
Mechanical Engineering,
and Architecture.

Entrance examinations June 12 and Sept. 19. For Annual Register containing requirements for admission and courses of instruction, with details as to the system pursued, apply to the PRESIDENT of the UNIVERSITY, or the DEANS of the DEPARTMENTS at ITHACA, N. Y.

PAINE & LADD,

HALBERT E. PAINE, Late Comm'r Patents, } Washington, D. C.
STORY B. LADD, }

Solicitors of Patents and Attorneys in Patent Cases.

Found at Last.

A CHEAP

COUNTER CLIP,

(PATENT APPLIED FOR.)

CHEAPER THAN PASTE.

Blanks Removed Without Tearing.

Price, post-paid, 15 cents Per doz., post-paid, \$1.50. Discounts to the Trade or to Telegraph Co.s, in quantities. Larger sizes made to order to wall, for Paper Bags, Wrapping Paper, &c. Address,

W. W. PRICHARD,
Ironton, Ohio.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, JULY 20, 1892.

WHOLE NO. 349.

THE ELECTRO-CHRONOGRAPH.

In 1848 Dr. John Locke, of Cincinnati, invented his "electro-chronograph," which he also called "a telegraphic clock for longitude," and on the 30th of December of that year he sent a description of it to Lieutenant M. F. Maury, who was then at the head of the Naval Observatory. Mr. Maury saw the value of the invention, and by his efforts induced Congress to pass the act of March 3, 1849, which appropriated \$10,000 to purchase from Dr. Locke a clock and chronograph for the Naval Observatory. The apparatus was constructed as rapidly as possible, and was first used at the Observatory on December 7, 1849. The United States Coast Survey also took it up, and its success was so great that in a few months it was adopted by European astronomers, who designated it as "the American method." To-day it is used in every observatory in the world, and is universally admitted to afford the most accurate known method of determining longitudes. Dr. Locke's invention was both ingenious and simple. It consisted essentially in causing a clock pendulum to make, or break, an electrical current for an instant at each beat, and in using this current to record a time scale upon a piece of paper moving with a uniform velocity. The apparatus for producing this result may be almost infinitely varied according to the fancy of the designer. The method adopted at the Naval Observatory for causing a clock pendulum to close an electric circuit for an instant at each beat, is to attach one end of the wire to the top of the pendulum, and the other end to a globule of mercury through which the pendulum swings at the middle of its beat. For the recording apparatus, an elaborately constructed cylinder chronograph is most convenient, but an ordinary telegraph register is just as accurate. In the latter case the record consists of a series of dots, made at perfectly regular intervals, the spaces between any two of them representing the time elapsing between two consecutive beats of the pendulum. If the pendulum beats seconds, as is usually the case with astronomical clocks, the dots will represent a scale of seconds, flowing along with the same regularity as time itself. When it is desired to note the instant of any event upon this scale the observer taps a telegraph key provided for the purpose and an extra dot is produced, the position of which, relatively to the preceding and following second dots, can be read off with the utmost exactness.

HOW IT IS OPERATED.

Local time can be most accurately determined by observing stars with a transit instrument, and the observation consists in noting the reading of the clock at the instant when the star passes behind each of the spider lines which are stretched across the field of view of the instrument. Before Dr. Locke's time this had to be done by eye and ear; but now the observer sits with his eye at the instrument and a telegraph key in his hand, and by tapping upon the

latter as the star crosses each wire he records the times of transit far more easily, with greater freedom from mistakes and somewhat more accuracy than is possible in any other way. The almanac tells when the star actually crossed the meridian, and after certain corrections the observations tell when the clock says it crossed. The difference of these two times is the error of the clock.

Now, imagine two observers—one at Washington and the other at New York—each provided with a transit instrument, a clock and a chronograph. Let each of them determine his local time in the way just described, and then by means of the telegraph lines connecting the two cities let the chronographs be put in electrical connection with each other, and let the Washington clock record its beats upon the New York chronograph along with those of the New York clock, and in its turn let the New York clock record its beats upon the Washington chronograph along with those of the Washington clock. Thus the New York and Washington local times will be compared in the most accurate manner immediately after the time-observations have been made, and before the clocks have had any chance to alter either their errors or their rates. This is Dr. Locke's method of measuring differences of longitude. It is commonly called the telegraphic method, and is so far superior to all others that at the present day no longitude is considered well known unless it has been determined in that way. Nevertheless, for many years this admirable method was embarrassed by a serious practical inconvenience. Few of the places whose longitude require determination are provided with fixed observatories, and to accommodate the necessary instruments temporary observing huts have to be erected. An astronomical clock is an essential part of the apparatus; but, unfortunately, such clocks are difficult to transport, and will not perform well unless they are mounted upon heavy masonry piers, while to erect such piers in temporary observing huts is an expensive proceeding, which involves much delay, because the mortar is long in setting firmly enough to give the requisite steadiness. This combination of difficulties long formed a serious drawback to the method, but it is now happily overcome by abandoning the use of clocks in field observations. Such a step first became possible about 1870, when several European makers almost simultaneously turned their attention to the problem of constructing what are now called break circuit chronometers. The only difficulty encountered was the delicacy of the mechanism required; but this was soon mastered, and box chronometers were produced which opened and closed an electric current with as much regularity and efficiency as the best clocks. When the United States transit of Venus parties were fitted out in 1873 Messrs. Negus, of this city, made for them the very excellent break-circuit chronometers, but at that early day it was not thought prudent to trust to these instruments alone, and, in addition, each party took with it a good astronomical clock.

Since then experience has demonstrated that in field observatories break-circuit chronometers perform better than clocks, and the transit of Venus parties, to be sent out this year, will leave their clocks at home. The experience of the United States Coast Survey astronomical parties has been in the same direction, and they also have abandoned clocks for break-circuit chronometers.

The telegraphic method of determining longitudes was first used in 1849 by the officers of the United States Coast Survey, between the High School observatory in Philadelphia and the observatory of Western Reserve College in Hudson, Ohio, and also between the High School observatory and Seaton Station, in Washington, D. C. Since then it has been used in the United States on hundreds of occasions; but singularly enough its use among foreign nations has been less extensive. Probably this is due to their cumbersome regulations, which make the handling of telegraph lines by persons other than the regular employees a difficult matter. At all events the fact remains that most of the determinations through long submarine cables have been made by United States officers. The Atlantic cables were used by the Coast Survey to determine fundamental longitudes in the United States, while many other cables have been used by officers of the navy, particularly Lieutenant Commander F. M. Green, to determine longitudes in the West Indies, on both coasts of South America, in the Mediterranean, in Australia, in the East Indies in China, and in Japan. The field work in the last named region has just been finished, and Lieutenant Green has recently returned to Washington, to reduce his observations.

THE PAST AND THE PRESENT.

What a contrast exists between the condition of science at the dawn of the seventeenth century and in the last quarter of the nineteenth! Then the art of navigation was about as Columbus left it, and that was so bad that the exact position of the land which he first saw in the New World is a matter of dispute. Now the captain of a cable ship in mid-ocean fearlessly cuts the telegraph cable which he is paying out and buoys it, confident that he can return with unerring certainty to this speck in the trackless waste of waters. But accurate as are the instruments and methods of navigation, their perfection falls far short of those at the command of astronomers. Years of work with occultations, moon culminations, and chronometers, left us with an uncertainty of a quarter of a mile in the difference of longitude between Greenwich and the Naval Observatory at Washington. To-day the telegraphic method has reduced the uncertainty to less than one hundred feet.

The telephone is utilized in Colorado and New Mexico in many instances to unite the widely separated ranches of the large herdsmen, saving them many miles of travel each day.

Journal of the Telegraph.

PUBLISHED MONTHLY, ON THE 20TH OF EACH MONTH, AT
195 BROADWAY.

THE JOURNAL is issued on the 20th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,750 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

invariably in advance.

One Copy, one year, postage included..... \$ 1 50
One Copy, six months, postage included..... .75
Single Copies, 15 cents.

ADVERTISING RATES.

One Inch space—each insertion..... \$ 2.00
Half Inch " " 1.00
Quarter Column, " 4.00
Half " " 8.00
One " " 16.00

Outs charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, JULY 20, 1882.

GOOD MANNERS IN BUSINESS.

ONE of the greatest evils which afflicts the American nation is bad or disagreeable manners. It is not confined to any particular business, nor is any business or occupation free from it. It is found in the pulpit, in the learned professions and in literature as well as in the daily press, and in all kinds of business. It is chiefly confined to language and in individual expression, hence, the more frequent and close the personal intercourse the more of it is thrust upon us. It even often reigns supreme where pecuniary gain is to be lost thereby. Salesmen in stores and clerks in post offices and other government employees where personal inquiry is necessary, generally have it to a more or less extent, that is, some have it and others may not, but we are never sure of being free from it in any place unless we have had happy experience to the contrary. The customers are by no means free from it, and sometimes kindle the spark which results in a series of explosions on each side. The blame is never entirely on one side. The proverb of Solomon that "he who ruleth his own passions is greater than he who taketh a city," is as true at the present time and as worthy of remark as it was in those ancient days. The bad manners to which we now refer is bad temper and petulance, willfully and intentionally expressed in words.

Telegraph offices are greatly afflicted in this way, and perhaps they are as ready to and do inflict others in a similar manner. But they are more subject to this evil because of the peculiar mental condition of the persons with whom they deal. A person comes into a telegraph office in a great hurry and scribbles off a message and hands it to the receiving clerk who counts the words and tells the price; it

may be thought too expensive and then it is tried again and studied over and shortened, then the clerk must read it over to the person to see if it is readable and can properly be understood, this is where the load exhausts the patience of the sender, and if his writing cannot be as readily deciphered and understood as plain print he breaks out, especially if the receiving clerk also exhibits petulance or scowls or hesitates or reads absurd words in the message. Where the receiving clerk and the operator is the same person, as is usually the case throughout the country, he is more nervous and sensitive than are those in occupations where in-door confinement is less. But in all cases he is more frequently called upon to exercise the God-like spirit of patience than are these in other occupations. Whatever his feelings of irritability are he must not exhibit them or retaliate without harm to the service and the charge of being rude, impolite, etc., and what is more, to be plainly and earnestly told so to his face. No wonder, then, that human nature or animal nature does stand up to assert itself sometimes under some circumstances. This is the practical view of it, but the preaching must ever be that "soft words turneth away wrath," whether they do or not, good manners often requires the trial of them in such cases and in all other cases.

It cannot be denied that the "sharp extremities of fortune" incident to life would be much less poignant if more good manners were to be found or expected from those we daily meet.

EARLY RAILROADING.

THE PASSENGERS ON THE FIRST TRAIN FROM ALBANY TO
UTICA.

A FORMER resident of the Mohawk Valley, N. Y., contributes to the Minneapolis (Minn.) Tribune, the following reminiscences concerning the opening of railroad communication between Albany and Utica: "A personal item in the Tribune some weeks ago, mentioning William Marshall of Schenectady, (father of Mrs. George B. Hall of Minneapolis), as conductor of the first railway passenger train run by steam in the United States, recalled to the writer's recollection his first railway ride on the same road and the two inclined planes up which the cars were drawn by stationary engines at Albany and Schenectady. The road, now a part of the New York Central, was from Albany to Schenectady, sixteen miles. The company to build it was chartered in 1826 and called the Mohawk and Hudson Railroad Company. Construction was begun in 1830, and in September, 1832, the road was open for traffic. The capital was furnished by moneyed men at New York city. John B. Jervis, the famous civil engineer, now of Rome, Oneida county, superintended the building of the road, and during his progress, having his headquarters at Schenectady, he was a constant patron of Billy Marshall, who then kept a livery stable. The president of the company was the Hon. John I. DeGraff, then Mayor of Schenectady, and formerly a member of Congress.

THE FIRST PASSENGER TRAIN

left Albany for Schenectady September 24, 1832. It consisted of a reconstructed English locomotive, weighing about four tons, which more resembled Saroni's light steam wagon than a locomotive, a small platform car for a tender, carrying two barrels of

water and a few armful of wood, and two passenger cars. These passenger cars were made by taking the bodies of thorough-brace stage coaches from their road wheels and mounting them each on four car wheels. The engineer and fireman was John Hampson, an Englishman. An artist of the day made a picture of the train by cutting paper to represent it, and from this outline engravings were made which are still extant. In these Marshall, as conductor, is represented as seated outside, in front of the first coach. The passengers were Capt. R. G. Orutenden, S. Wilcox, Lewis Benedict, Joseph Alexander, Charles E. Dudley, Jacob Hayes, John Meigs, Edwin Croswell, Billy Winne, John Townsend, John DeGraff, Thurlow Weed, Josiah Snow, Joseph C. Yates and Erastus Corning, making seventeen persons carried by the train. Wilcox then kept the Western Hotel at Albany, Alexander was President of the Commercial bank of that city, Hayes was High Constable of New York city, Meigs was Sheriff of Albany county, Croswell was editor of the Albany Argus, Winnie was the famous penny postman of Albany, and Weed was editor of the Albany Journal. This train made

THREE ROUND TRIPS A DAY

between Albany and Schenectady, or rather between the inclined planes, for horses were used to draw the cars into each city. Passenger tickets were sold at stores and shops for some time, and when the stages out prices the tickets went very low.

INVESTIGATING TORNADOES.

FACTS ABOUT THEM GATHERED BY THE SIGNAL BUREAU.

THE signal service bureau has for some time past been making a study of cyclones, and a Washington dispatch says Sergeant Finley is soon to start out to investigate the track of the storms which swept over Michigan, Iowa and Illinois on the 8th inst. Sergeant Finley has done some very valuable work on this subject. Last year the signal service issued, as one of its proportional papers, a very important monograph on the character of the storms of May 29 and June 30, 1880. The paper was very elaborate, and there is now in press another professional paper by the same writer, which contains a tabulated statement of 600 tornadoes and some generalizations from their facts, with some suggestions as to the methods that ought to be pursued in the investigation of the storms. The 600 storms cover a period of 87 years, and the whole country. Their examination leads to the conclusion that tornadoes occur most frequently in summer, and in the month of June. They have occurred, however, more frequently in April than in July, and in May and September than in August. Kansas is the State that has been most afflicted, and that notwithstanding the fact that the period during which tornadoes have visited it has been comparatively short. The State has had 62 tornadoes from 1859 to 1881. Illinois has had 54 from 1854 to 1881. Missouri has had 44 from 1814 to 1881. New York has had 35 from 1831 to 1881; Georgia, 33 from 1804 to 1881; Iowa, 31 from 1854 to 1881; Ohio, 28 from 1823 to 1881; Indiana, 27 from 1852 to 1880. The States and Territories that have had only one each from 1794 to 1881 are Colorado, California, Indian Territory, Nevada, New Mexico, Montana, Rhode Island, West Virginia and Wyoming. The storms occur most frequently from 5 to 6 o'clock in the afternoon, although there is no hour of the day that has been entirely free from them. The average width of the path of destruction is 1,085 feet, and the storm cloud runs with a velocity of from 12 to 60 miles. The wind within the vortex sometimes attains a velocity of 800 miles an hour, the average velocity being 392 miles.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, July 20, 1882.

To all offices on Western Union lines:

The following is reprinted from the JOURNAL of June 20, 1882:

REVISION OF SPECIAL RATES.

Tuesday, August 1, 1882, all special rates, i. e., rates higher or lower than the regular (Square and State) rates of the Tariff Book, will be cancelled unless otherwise ordered before that date.

A revision of special rates has recently been made, and new lists will be issued, before August 1, to offices which, on and after that date, will continue to use special rates.

Offices having special rates not included in the new lists, and which, in the opinion of the manager it may be important to retain, should notify their superintendents of such rates as soon after July 20 (on which date the new special rates should be in the hands of managers who are to receive them) as possible, so that if advisable their retention may be authorized and ordered. If no authority is received to continue such rates after August 1, they must be cancelled on that date.

Rates less than twenty-five cents between offices in the same town or city are to be excepted from the operation of this order, they must not be changed unless changed by the new lists.

The special rates referred to, in the second paragraph of the above order, have been prepared and distributed. Managers who receive them should at once enter them in their Tariff Books, and cancel all other special rates except those referred to in the last paragraph of the order.

Attention is called to that part of the order which invites suggestions as to the retention of special rates, not included in the new lists.

"Local Rates" for distances of less than fifty miles, which are used by offices in most of the States and Territories west of the Mississippi River; Government rates (see page VI. of the Tariff Book) Cable rates and the rates to Galveston, Tex., given in the JOURNAL of June 20, 1882, for messages to and from Mexico, are not special rates within the meaning of the above order, and should not be cancelled August 1, 1882.

FRANKED MESSAGES TO AND FROM THE GREAT NORTH WESTERN TELEGRAPH COMPANY'S OFFICES.

The order, with the above heading, printed in the JOURNAL of March 20, 1882, which provides for the payment of tolls on messages therein described, should be applied to similar messages to and from the G. N. W. Co.'s offices in the United States, named in the JOURNAL of March 1, 1882.

CHANGES.

The following changes which have been made since June 20, 1882, should be entered in the Tariff Book as they will not be republished.

CALIFORNIA.

- * Allens Springs, reopened. 50 3 Colusa.
- 762 Big Trees, reopened.
- * Congress Spring, reopened, 25 2 telephone, Santa Clara.
- 808 Tyrone, reopened.

COLORADO.

- 554 Apishapa, closed.
- * Gothic, reopened.
- 598 Red Hill, closed.
- * Silverton, now W. U. office. Square 634.

DAKOTA.

- 904 Gayville, closed.
- 904 Jefferson, closed.

DELAWARE.

- 60 Laurel is now open permanently.

FLORIDA.

- * Bagdad, changed to * Blackwater.

ILLINOIS.

- 327 Havana Junc. changed to 327 Lodge.

397 Lake Bluff, reopened.

* * Nauvoo, now 20 1 telephone, Keokuk, Iowa.

INDIANA.

The telephone charges from Columbus, Ind., to Hartsville, Hope and Petersburg is now 15 and 1.

IOWA.

397 Independent, Van Buren Co., changed to 397 Selma.

MAINE.

- * * Lubec Point, now 100 Eastport.
- 14 Woodford's Corner, closed.

MASSACHUSETTS.

* * Cottage City is now W. Union office, Tariff 25 cents more than Woods Holl, Ch. direct.
The rate to all other places on the Island of Martha's Vineyard, given under Martha's Vineyard in Tariff Book, is 15 cents by telephone from Cottage City.
25 East Douglass, closed.

MEXICO.

* Ojo Caliente, 450 43 Galveston, Texas, or 48 5 El Paso, Tex.

The tariff to Brownsville, Tex., on business to and from the offices in Mexico, given in last JOURNAL with tariff for "other" lines from Brownsville, will be the regular square or State rate. The special rates heretofore applied have been cancelled.

MICHIGAN.

- * Greenwood, closed.
- 147 Ossineke, reopened.
- The following are "other" line rates to "other" line offices beyond Houghton:
- Allouez, 40 3 (25 2 N. M.) Houghton.
- Calumet, 30 3 (25 2 N. M.) Houghton.
- Copper Falls, 70 5 (35 2 N. M.) Houghton.
- Eagle River, 60 4 (30 2 N. M.) Houghton.
- Eagle Harbor, 70 5 (35 2 N. M.) Houghton.
- Phoenix, 60 4 (30 2 N. M.) Houghton.

MINNESOTA.

W. Union offices in Minnesota whose rate to St. Paul and Minneapolis, Minn., was made 40 and 3 by the order in the JOURNAL of Feb. 1, 1882, will continue such rate on and after August 1, 1882; it is a special rate which is not to be cancelled by the order at the head of this circular.

MISSOURI.

- * Jackson, Cape G Co., closed.
- 428 Sweet Springs, Saline Co., reopened.
- Communication by telephone, between Miami Station and Fairville—Malta Bend—Miami and Waverly is interrupted. Until further notice, messages for the places named should be sent via, and checked with Marshall. No charge for "other" lines.

MONTANA.

- * Coal Banks is now W. Union office. Square 958.
- * Rosebud is now W. Union office. Square 958.

NEBRASKA.

- * Calvert, changed to * Auburn.

NEVADA.

- 710 White River, closed.

NEW MEXICO.

- 560 Levy, closed.

NEW JERSEY.

- Erase Sea Girt, N. J., from the circular headed American Union Franks, given in JOURNAL Feb. 1, 1882.
- 41 Beach Haven, now * Beach Haven, 25 1 Philadelphia, Pa.
- 41 Port Johnston is not open Sundays.

NEW YORK.

- 40 Catskill Point, reopened.
- 57 Five Mile Point, Otsego Lake, reopened.
- 46 Guymard, reopened.
- 35 Hulet's Landing, reopened.
- * Kattskill House, reopened.
- * Pearl Point, reopened.
- 139 Point Chautauqua, reopened.
- 37 Mixzen Top, reopened.
- * Remsen, now W. Union office. Square 57.
- 73 Thousand Island House, reopened.
- 57 Trenton Falls, reopened.
- * Weston is in Schuyler Co.
- 83 Woodburg, reopened.

OHIO.

- 222 Allentown, closed.
- 169 Little Mountain, reopened.

PENNSYLVANIA.

- 130 Clarendon, tariff same as Warren.
- 140 Coalville, Butler Co., changed to 140 Coaltown.
- 140 Criswell Station, closed.
- 112 Oresson Springs, reopened.
- 140 Greece City, closed.

* 140 Smoky City Sta., closed.

59 Media Depot, Ch. Media.

RHODE ISLAND.

- * Button Wood Beach Hotel, reopened.
- * Rocky Point, reopened.

UTAH.

- * Silver Reef, now 75 5 Salt Lake City.

VIRGINIA.

- 183 Alleghany Springs, reopened.
- 183 Blue Ridge Springs, reopened.
- 95 Fauquier White Sulphur Springs, reopened.
- 142 Healing Springs, reopened.
- 142 Hot Springs, reopened.
- * Holcomb's Rock, closed.
- 69 Ocean View, reopened.
- 118 Orkney Springs, reopened.
- 142 Rockbridge Alum Springs, reopened.

WASHINGTON TERRITORY.

- 738 So. Ainsworth, closed.

WEST VIRGINIA.

- 183 Sweet Springs, reopened.

WISCONSIN.

- 306 Giffords, [reopened].
- * Richland Center, now W. Union office. Square 345.
- W. Union offices in Wisconsin whose rate to Madison, Wis., was made 40 and 3 by the order in JOURNAL of Feb. 1, 1882, will continue such rate on and after August 1, 1882; it is a special rate which is not to be cancelled by the order at the head of this circular.

WYOMING.

- 548 Otto, closed.

CUBA CABLE.

The cables between Grenada and St. Vincent and between Guadeloupe and Dominica have been repaired.

The cable between Trinidad and Grenada has been broken, cutting off communication with all stations south of St. Thomas, except Trinidad and Demerara. Messages will be forwarded by best means.

The following list of telegraph stations on Government lines in Cuba will take the place of the list in the Tariff Book—pages 348 and 349, beginning with Altigracia and ending with Zaza. For rates see Tariff Book, page 348 under heading "To places in Cuba beyond Havana." Manzanillo and Guantanamo rates unchanged.

| | | |
|--------------------|------------------|---------------------|
| Arroya Blanco. | Guaimaro. | Sabana. |
| Aserradero. | Guanajay. | Sagua Tanamo. |
| Bahia-Honda. | Guanco. | San Andree. |
| Baire. | Guantanamo. | San Augustin. |
| Baitiquiri. | Guaracabuya. | San Antonio. |
| Baracoa. | Guines. | San Cristobal. |
| Batabano. | Guisa. | Sancti Spiritus. |
| Bayamo. | Holguin. | Sandoval. |
| Bejucal. | Jibaro. | San Diego—de los |
| Bemba. | Jicotea. | Rancos. |
| Boca. | Jiguaní. | San Geronimo. |
| Boca Sagua. | Jucaro. | Santa Clara. |
| Buenavista. | Jumento. | Santa Catalina. |
| Bueycito. | Libano. | Santa Cruz. |
| Cabañas. | Limones. | San Louis. |
| Cabaiguán. | Macagua. | San Miguel. |
| Calbarien. | Macurijes. | San Nicolas. |
| Calmanera. | Magarabomba. | Santo Domingo. |
| Camajuaní. | Malsi. | Sibanicu. |
| Caney. | Manzanillo. | Sitio. |
| Cardenas. | Mariel. | Soledad. |
| Canto-Abaio. | Matanzas. | Sojo. |
| Canto-Embarcadero. | Mayajigua. | Songo. |
| Cayo-Damas. | Mayari-Abaio. | Trinidad. |
| Chambas. | Minas. | Tunas de Zaza. |
| Ciego-de-Avila. | Moron. | Ti-Arriba. |
| Cobie. | Naranjo. | Tiguabos. |
| Colon. | Nuevitas. | Union. |
| Consolacion. | Palma-Soriano. | Vagueta. |
| Contramaestre. | Parades. | Velasco. |
| Corralito. | Pelayo. | Victoria. |
| Cristo. | Pinar-del-Rio. | Victoria de las Tu- |
| Dominguez. | Placetas. | nas. |
| Dos Palmas. | Puerto Padre. | Yaguajay. |
| Florida. | Puerto-Principe. | Yaguaramas. |
| Fray-Benito. | Remanganaguas. | Yaguas. |
| Gibara. | Remedios. | Yara. |

ATLANTIC CABLE.

Cable communication with Amoy broken. During interruption, messages will be forwarded by best means.

The cable to Alexandria, Egypt, is now worked from a ship some distance from shore. Messages for Egypt may be accepted only at sender's risk. Messages for Aden, South Africa and the far East will, for the present, be sent v'a Teheran, and the rate to Aden and all South Africa stations will be increased fifty-four cents per word.

For the month of July, and thereafter, offices will not make a separate report of Atlantic cable messages which may be sent or received by cables other than those of the Anglo American Co. All Atlantic Cable messages will be reported in one statement, (see JOURNAL of April 20, 1882,) and the messages should be entered in the order in which they are sent or received.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in three columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

| | | |
|-----------------|----------------|-----------------|
| 318 Akron. | 323 Cuba. | 267 Notasulga. |
| 245 Bangor. | 823 Epsom. | 824 Prichard. |
| 294 Briarfield. | 294 Fairville. | 266 Stock Mill. |
| 234 Calera. | 304 Massillon. | |

- * Alexander City, 40 3 (25 1 N. M. rate) Opelika.
- * Daleville 40 3 (25 1 N. M. rate) Opelika.
- * Ft Morgan, 75 6 Mobile.
- * Gainesville, 25 2 Opelika.
- * Goodwater, 40 3 (25 2 N. M. rate) Opelika.
- * Point Clear, 50 3 Mobile.

ARIZONA.

| | | |
|--------------------|--------------------|-----------------|
| 646 Adonde. | 640 Dragon Summit. | 642 Picacho. |
| 639 Bowie Station. | 644 Gila Bend. | 645 Sentinel. |
| 640 Canon Diablo. | 644 Gila Bend. | 645 Texas Hill. |
| 641 Contention. | 649 Holbrook. | 649 Winslow. |

- * Butte City, 50 4 Casa Grande.
- * Pinal, 60 4 (30 2 N. M. rate) Casa Grande.
- * Silver King 50 4 (30 2 N. M. rate) Casa Grande.

ARKANSAS.

| | | |
|----------------|------------------|----------------|
| 449 Brentwood. | 391 Jacksonport. | 449 West Fork. |
| 371 Knobel. | 401 Russell. | 449 Winslow. |

BRITISH COLUMBIA.

- * Bentons, 50 3 Sumas.

CALIFORNIA.

| | | |
|--------------------|---------------------|----------------------|
| 800 Alameda Point. | 799 Norman Station. | 718 Volcano Springs. |
| Ch. Alameda. | 800 Ocean View. | 827 Whitesboro. |
| 827 Albion Mills. | 720 San Geronimo. | |
| 800 Decoto. | 825 Table Bluff. | |

- * Bidwell's Bridge, 25 2 by telephone, Greenville.
- * Fall Brook, 40 3 San Diego.
- * Lafayette, 15 2 by telephone, Martinez.
- * Leesville, 50 3 Colusa.
- * Magalia, free, telephone, Oroville.
- * National City, 25 2 San Diego.
- * Walnut Creek, 15 2 by telephone, Martinez.

COLORADO.

| | | |
|-----------------------|------------------|--------------------------|
| 646 Agate. | 599 Hortense. | 634 Rockwood. |
| 655 Brea. | 623 Hot Springs. | 628 Sargents. |
| 634 Browns Canon. | 614 Ignacio. | 636 Sedgwick. |
| 640 Buffalo, Weld Co. | 640 Liff. | 645 Snyder. |
| 643 Calumet. | 628 Kezar. | 558 South Pueblo. |
| 562 Carr. | 552 La Salle. | Ch. Pueblo. |
| 640 Crook. | 658 Oak Creek. | 599 Tecumseh. |
| 645 Deuel. | 545 Orchard. | 594 Timpa. |
| 559 Earle. | 557 Pine Grove. | 599 Woodstock. |
| 641 First View. | 650 Pimon. | 569 Wootton, Ch. Morley. |
| 645 Hardin. | 657 Red Cliff. | |
| 630 Holleys. | | |

- * Akron, (N. M.) 65 4 Plattsmouth.
- * Albia 25 1 Gunnison.
- * Ashcroft (N. M.) 75 5 Gunnison.
- * Apen (N. M.) 85 6 Gunnison.
- * Bonanza (N. M.) 25 2 Villa Grove.
- * Conejos, 25 0 Antonito.
- * Eckley (N. M.) 60 4 Plattsmouth, Neb.
- * Elbert, (N. M.) 40 3 Denver.
- * Elizabeth, (N. M.) 25 2 Denver.
- * Franceville, (N. M.) 40 3 Denver.
- * Hyde, (N. M.) 60 4 Plattsmouth, Neb.
- * McConnellville, (N. M.) 40 3 Denver.
- * Madison June, (N. M.) 40 3 Denver.
- * Parkers, (N. M.) 25 2 Denver.
- * Pate Summit, 75 5 Plattsmouth, Neb.
- * Rock Springs, (N. M.) 65 4 Plattsmouth, Neb.
- * Wray (N. M.) 65 4 Plattsmouth, Neb.

CONNECTICUT.

| | | |
|--------------------|----------------|----------------|
| 25 Goshen, W'dham. | 37 Sandy Hook. | 29 South Lyme. |
| | 37 Southbury. | 37 Stepany. |
| 25 Hop River. | 37 Southbury. | 25 Thompson. |
| 25 No Windham. | | |

- * Bridgewater, 20 0 by telephone, New Milford.
- * Naubuc, 30 3 Hartford.
- * Noroton, 10 0 by telephone, Stamford.
- * Sherman, 20 0 by telephone, New Milford.
- * Warren, 20 0 by telephone, New Milford.
- * Whitneyville, 50 0 New Haven.
- * Winnipauk, 10 0 by telephone, Norwalk.

DAKOTA.

| | | |
|---------------------|------------------|-----------------|
| 8-6 Big Stone City. | 947 Green River. | 920 Northville. |
|---------------------|------------------|-----------------|

| | | |
|-------------------|-----------------|-----------------|
| 940 Canning. | 909 Henry. | 915 Ordway. |
| 915 Chamberlain. | 890 Hillsboro. | 903 Preston. |
| 509 Clark Centre. | 926 Hitchcock. | 924 Steele Sta. |
| 913 Cleveland. | 947 Houston. | 924 Sterling. |
| 947 Dickinson. | 896 Kindred. | 933 Sweetb jar. |
| 933 Eagles Nest. | 895 Mayville. | 947 Taylor. |
| 913 Eldridge. | 926 Miller. | 939 Wessington. |
| 908 Ellendale. | 898 Montrose. | |
| 890 Gardner. | 915 Mt. Vernon. | |

- * Crook City, 60 2 by telephone, Deadwood.
- * Colman, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Dell Rapids, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Egan, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Fortisset, 25 1 Webster.
- * Howard, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Madison, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Pine Ridge Agency, 150 9 Cheyenne Wy.
- * Poplar River, 25 1 Blmarck.
- * Rosebud Agency, 175 10 Cheyenne Wy.
- * Spear Fish, 50 2 by telephone, Deadwood.
- * Sturgis City, 50 2 by telephone, Deadwood.
- * Wentworth, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.

DELAWARE.

| | | |
|-----------------|-------------|-------------------------|
| 67 Bear. | 67 Harley. | 67 Porters. |
| 60 Broad Creek. | 67 Klamond. | 60 Ross, Summer office. |

FLORIDA.

- * Blackwater, 50 5 Pensacola.
- * Blue Pond, 75 5, (50 3 N. M. rate) Lake City.
- * Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
- * Highland, 50 4 Lake City.
- * Kassinsee (N. M.) 150 10 Lake City.
- * Lehigh Sta., 75 5 (50 3 N. M. rate) Lake City.
- * Micapony 75 5 (50 3 N. M. rate) Lake City.
- * Paola, (N. M.) 100 6 Lake City.
- * Perry Junction, 75 5, (50 3 N. M. rate) Lake City.
- * Tocot, (N. M.) 50 3, Lake City.
- * Waite Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

| | | |
|-----------------|--------------------|---------------------|
| 407 Dubois. | 226 Lawrenceville. | 197 Surrency. |
| 246 East Point. | 186 Midville. | 226 Suwanee. |
| 187 Folkston. | 186 Perkins June. | 187 Victoria Mills. |
| 176 Johnston. | 246 Roswell. | |

- * Abbeville (N. M.) 40 3 Ft. Gaines.
- * Arlington, 40 3 Ft. Gaines.
- * Blakely, 40 3 Ft. Gaines.
- * Cedartown, 30 2 Cartersville.
- * Rockmart (N. M.) 25 2 Cartersville.
- * Senola, (N. M.) 25 2 Newnan.

IDAHO.

| | | |
|-------------------|-------------------|-----------------|
| 878 Arimo. | 970 Dry Lake. | 970 Rathdrum. |
| 970 Clark's Fork. | 970 Hope Station. | 970 Sand Point. |

ILLINOIS.

| | | |
|---------------------------------|------------------------------|--------------------------|
| 316 Algonquin. | 307 Dunmer. | 316 Richmond. |
| 300 Alton. | 346 Forreston June. | 309 St. Marie. |
| 307 A. pine. | 318 Gays. | 299 Sidell. |
| 336 Annawan. | 318 Hazel Dell. | 297 State Line, Lake Co. |
| 299 Barton. | 308 Henderson. | |
| 328 Beecher City. | 299 Indian la. | 318 Stockton. |
| Effingham Co. | 357 Knox, Ch. Galva. | 346 Union Grove. |
| 329 Belknap. | 327 Lodge. | 318 Wadd. |
| 298 Bondfield. | 307 Mannheim. | 307 Wayne. |
| 336 Bureau, Ch. | 309 Montrose, Effing. | 309 West Liberty. |
| Irinceton. | 318 Westfield. | |
| 336 County Line Ch. | 326 Nachusa. | 299 Wetzel. |
| Kewanee. | 307 New Lebanon. | 309 Wheeler. |
| 336 Duggan, Ch. Ke-347 Oakford. | 308 Wrights, Ch. Greenfield. | |
| Wannoe. | 3 9 Obion. | |
| 368 Epperson, Ch. 358 Palmyra. | | |
| Bushnell. | | |

- * Alton, 25 2 Huntingburg, Ind.
- * Belmont, 25 2 Huntingburg, Ind.

INDIANA.

| | | |
|------------------------|----------------------|-------------------------|
| 252 Briant. | 270 Grangers. | 300 Owensville. |
| 228 Cedar Lake, Sum. | 300 Ingles. | 261 Oswan. |
| mer office. | 253 Letts Oornes. | 290 Paxton. |
| 251 Centerton. | 298 Lowell, Lake Co. | 298 Rose Lawn. |
| 300 Cynthia. | 241 Maples. | 253 Sa dinia Cross-ing. |
| 251 Daleville. | 262 Maxwell. | |
| 300 English Lake. | 282 Milroy. | 271 Sedalia. |
| 259 Fountain, Vigo Co. | 300 Monon. | 300 Wad-sville. |
| | 300 New Harmony. | 255 Westport. |

- * Birdseye, 25 2 Huntingburg.
- * Evansville, 15 1, telephone Columbus.
- * Ottford, 15 1, telephone Columbus.
- * Grandall, 25 2 Huntingburg.
- * Ferdinand. By mail, Ferdinand Station.
- * Hartford, Crawford Co., 25 2 Huntingburg.
- * Indiana, free, by telephone, Dana.
- * Lowell, Bartholomew Co. 15 1, telephone Columbus.
- * Mintoan, 25 2 Huntingburg.
- * Morris City, 25 2 Huntingburg.
- * Oakland City, 25 2 Huntingburg.
- * St. Louis Crossing 15 1, telephone Columbus.
- * St. Meinrad. By mail, Ferdinand Station.
- * Wayne City, 25 2 Huntingburg.
- * Winslow, 25 2 Huntingburg.

IOWA.

| | | |
|---------------------------|--------------------------------|--------------------------|
| 463 Alton. | 454 Gray. | 417 Numa. |
| 428 Angus. | 425 Hardy. | 416 Pilot Mound. |
| 887 Ashton. | 416 Harcourt. | 417 Polo. |
| 428 Bancroft. | 444 Havelock. | 463 Remsen. |
| 417 Bethany June. | 455 Henderson, Ch. Ch. Lamont. | 416 Renwick. |
| | Hastings. | 846 Riggs, Ch. Pres-ton. |
| 425 Bradgate. | 426 Herndon. | |
| 346 Browns, Ch. Pres-ton. | 425 Irvington. | 425 Rubens. |
| | 386 Jackson June. | 425 Rutland. |

| | | |
|-------------------|--------------------|----------------------------|
| 867 Buffalo. | 416 Kamrar. | 867 Sand Spring, Ch. |
| 425 Burt. | 464 Irwin. | Ann-mosa. |
| 3 8 Ch.riestown. | 435 Kallio. | 897 Selma. |
| 426 Cliv. | 443 Kirkman. | 444 Sioux Rapids. |
| 426 Cooper. | 388 La Crosse, Ch. | 455 St. Louis. |
| 425 Dakota City. | Hamill. | 455 Stennett, Ch. Oak. |
| 387 Donahue, Ok. | 435 Lake City. | |
| Dixon. | 407 Laurel. | 416 Thor. |
| 876 Fetherville. | 444 Laurens. | 416 Turall. |
| 417 Evine. | 397 Libertyville. | 407 Van Cleave. |
| 367 Fairport. | 435 Lohrville. | 417 Van Wert. |
| 435 Farnhamville. | 444 Marathion. | 367 Viola, Ch. Stone-City. |
| 431 Fletcher. | 367 Montpelier. | |
| 416 Galt. | 455 North Boro. | 425 West Bend. |
| 407 Girard. | | |

KANSAS.

| | | |
|-----------------|---------------------|--------------------|
| 517 Alum Creek. | 514 Galva. | 475 North Topeka. |
| 466 Argentine. | 507 Hazelton. | Ch. Topeka. |
| 465 Baker. | 508 Horton. | 509 Strong City. |
| 468 Barclay. | 456 Huron. | 457 Uniontown. |
| 457 Branson. | 455 Laura ter. | 518 Valley Center. |
| 521 Chase. | 527 Leonard. | 476 Wakarusa. |
| 527 Cleveland. | 507 Miltonvale. | 447 Waseca June. |
| 517 Clifton. | 448 Mulberry Grove. | 468 Westphalia. |
| 527 Collier. | 156 North Lawrence. | 468 Willis. |
| 503 Crawford. | Ch. Lawrence. | 476 Yates Center. |
| 527 Edmond. | | |
| 456 Eve, est. | | |

- * Cottonwood Falls, 50 0 Strong City.
- * Enterprise, 15 0, by telephone, Detroit.

KENTUCKY.

| | | |
|--------------------|-----------------------|------------------|
| 263 Bloomfield. | 253 Glasgow. | 263 Taylorville. |
| 248 Crescent Hill. | 243 Pine Hill. | 339 Wickliffe. |
| 243 Denersail. | 243 Rocky Hill. | |
| 263 Finchville. | 263 South Louisville. | |

- * Clay Lick, 25 1 by telephone, Worthville.
- * Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Hunting-ton, W. Va.
- * Eastern June, 50 3 Lexington, Ky., or 55 3 Hunting-ton, W. Va.
- * East Ky. June, 35 2 Huntington, W. Va.
- * Flemingsburg, 15 2 by telephone, Johnson June.
- * Glasgow, 25 1 by telephone, Worthville.
- * Gratz, 25 1 by telephone, Worthville.
- * Kilgore, 30 2 Huntington, W. Va.
- * Lockport, 25 1 by telephone, Worthville.
- * Marion, 15 1 by telephone, Worthville.
- * Mt. Savage, 50 3 Lexington, Ky., or 55 3 Huntington, W. Va.
- * Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. Va.
- * Peach Orchard, 25 2 Catlettsburg.
- * Pine Grove, 50 3 Huntington, W. Va.
- * Port Riffe, 25 1 by telephone, Worthville.
- * Bush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
- * Springport, 20 1 by telephone, Worthville.

LOUISIANA.

| | | |
|---------------------|--------------------|----------------------|
| 404 Atchafal ya. | 395 Grosse Tete. | 433 Prudhomme. |
| 395 Baton Rouge Jr. | 354 Lookout. | 433 Bobeline. |
| 424 Boyce. | 424 Lecco pte. | 442 San Patrice. |
| 424 Brea. | 434 Mornementau. | 433 Sinnott. |
| 424 Garland. | 433 Moreland. | 442 Stonewall. |
| 424 Gloster. | 895 Plaquemine. | 395 Vacherie. |
| 375 Goulsboro. | 442 Pleasant Hill. | 395 W. B. ton Rouge. |
| 442 Grand Cane. | 433 Provencal. | 442 Whitesville. |

- * Fodoch, 50 3 (30 2 N. M. rate), New Orleans.
- * Milkens Bend (N. M.) 40 3 Ta lula.
- * St. James, 50 3 (30 2 N. M. rate), New Orleans.

MAINE.

| | | |
|--|--|--|
| 4 Presque Isle. | | |
| * La Grange, 25 2 Bangor. | | |
| * Po and Spring, Summer Office, 20 1 Lewiston. | | |
| * Red Beach, 15 1 telephone Cat is. | | |
| * Robinson, 20 1 telephone Calais. | | |
| * Sebec, 25 2 Bangor. | | |
| * So. La Grange 25 2 Bangor. | | |

MANITOBA.

| | | |
|-----------|-------------------|--------------------|
| Anstin. | Portage La Prati- | Sewell. |
| Brandon. | rie sta. | St. Boniface June. |
| Lewiston. | Reburn. | Westbourne. |
| Gadstone. | Rosser. | West Lynne. |

The above named offices in Manitoba should be checked at rect at the Manitoba State rate.

MARYLAND.

| | | |
|--------------------------|----------------------------------|--------------------------------|
| 85 Ashland. | 60 Frittlind. | 54 Peninsular June. |
| 67 Black, summer office. | 85 Lutherville. | 54 Pocomoke sta-tion Ch. Foke. |
| 77 Bowie. | 77 Marboro. | |
| 67 Edgewood. | 67 Ottorora, Ch. Rowlands-ville. | |
| | 85 Odenton. | |

- * Gaithersburg, 25 2 Baltimore.
- * Hyattsville, 25 2 Baltimore, Md., or Washington, D. C.

Charge for three extra words in messages to Gaithersburg and Hyattsville, and accept only prepaid day messages.

MASSACHUSETTS.

| | | |
|------------|-------------------------------|---------------|
| 86 Conway. | 21 Wellesley Hills. | 21 Tyngsboro. |
| 25 Oxford. | 12 W. Harwich, Ch. Lunenburg. | |

- * Asylum Sta., 75 0 Danvers.
- * Bass River Harbor, free by telephone, So. Dennis.
- * Burlington 150 0 Woburn.
- * Cohasset, 25 0 by telephone, East Bridgewater.
- * Collins Mills, Dracut, 15 1 by telephone, Lowell.
- * Cummingsville, 50 0 Woburn.
- * Danvers Centre, 25 0 Danvers.
- * Danvers Insane Hospital, free by telephone, Salem.
- * Danversport, 25 0 Danvers.
- * Dracut Navy Yard, 15 1 by telephone, Lowell.
- * Forge Village, 15 1 by telephone, Lowell.
- * Gardner, 15 0 Gardner Depot.
- * Gaitheville, 15 1 by telephone, Lowell.
- * Holbrook, free, Braintree.
- * Hyannisport, 15 0 by telephone, Hyannis.
- * Luccanburg, 15 0 by telephone, Fitchburg.
- * Matfield, 50 0 East Bridgewater.

Digitized by Google

- * Rhea Springs, Summer office, 25 2 Spring City.
- * Somerville, 25 2 Moscow.
- * Olton, 25 2, River.

TEXAS.

- | | | |
|------------------------|------------------------|-------------------------|
| 500 Abbott. | 460 Forest. | 657 Sierra Blanca (So.) |
| 552 Albany. | 672 Haskell (South). | 656 San Martin (So.) |
| 550 Aledo. | 648 Hodge. | 674 Strowb'dge (So.) |
| 651 Alexander. | 654 Itan (South). | 603 Temple Juno. |
| 656 Antelope (South). | 603 Lorena. | 490 Thorndale. |
| 669 Atascosa (South). | 470 Lodi. | 603 Troy. |
| 479 Bagwell. | 655 Metz (South). | 480 Tucker. |
| 657 Boracho (South). | 673 Marfa (South). | 670 Twohig (So.) |
| 670 Catulla (South). | 456 Margaret. | 657 Van Horn (South) |
| 657 Carls Pass (So.) | 608 Mountain Home | 470 Wayne. |
| 470 Carroll's Prairie. | Ball Co | 671 Webb (South). |
| 485 Clear Creek. | 669 Odessa (South). | 500 West. |
| 495 Cuero (South). | 656 Pearall (South). | 657 Wildhorse (South) |
| 499 Davenport (So.) | 655 Pyote (South) | 483 Winona. |
| 670 Encinal (South). | 652 Putnam. | 489 Wharton. |
| 603 Eddy. | 656 Sand Hills (So.) | 830 Yaleta (So) |
| 510 Farmersville. | 830 San Elizario (So.) | |
- * Aguilares, 50 3 Corpus Christi, or 30 2 Laredo.
 - * Aurora, 25 2 Ft. Worth.
 - * Benavides, 40 3 Corpus Christi, or Laredo.
 - * Bowie, 40 3 Fort Worth.
 - * D'hania, 50 3 San Antonio.
 - * Eagle Pass Junction, 100 7 San Antonio.
 - * Henrietta, 25 1 Denison, Texas, or Dodge City, Ka.
 - * Hondo City, 50 3 San Antonio.
 - * Kounts, 85 2 Beaumont.
 - * Lacoste, 40 3 San Antonio.
 - * Los Angeles, 50 3 Corpus Christi, or 30 2 Laredo
 - * Pena, 40 3 Corpus Christi, or Laredo.
 - * Realitos, 40 3 Corpus Christi.
 - * Sabinal, 7 5 San Antonio.
 - * Salado, 40 3, Austin.
 - * San Diego, 40 3 Corpus Christi, or 50 3 Laredo.
 - * Village, 40 2 Beaumont.

UTAH.

- 575 Hot Springs.
- * No Ogden 30 2 by telephone, Ogden.
- * Plain City, 50 3 by telephone, Ogden.

VERMONT.

- | | |
|---------------------------|-----------------------|
| 38 Congress Hall Sheldon. | 27 Passumpsic. |
| Summer office. | 31 Pompanoosuc. |
| 38 Maquam Bay. | 39 South Wallingford. |
| 27 Miles Pond. Ok. St. | Johnsbury. |
- * East Arlington, 10 1 Arlington.
 - * E. Rupert, 15 2 Factory Point.
 - * Guilford, 10 0 by telephone, Brattleboro.
 - * Hartwellville, 20 1 by telephone, No. Adams, Mass.
 - * Jacksonville, 25 2 by telephone, No. Adams, Mass.
 - * North Stamford, 15 1 by telephone, No. Adams, Mass.
 - * Readsboro, 20 1 by telephone, No. Adams, Mass.
 - * Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
 - * Sadauga, 25 2 by telephone, No. Adams, Mass.
 - * Stamford, 15 1 by telephone, No. Adams, Mass.
 - * Wells, 15 2 Factory Point.
 - * West Arlington, 15 1 Arlington.
 - * West Dover, 25 0 by telephone, Brattleboro.
 - * Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

- | | | |
|--------------------|----------------------|---------------------|
| 123 Afton. | 114 Concord. | 86 R. F. & P. Juno. |
| 114 Appomattox. | 123 Milnes. | 163 Roanoke. |
| 153 Backbone. | 162 New River Depot. | 113 Troutville. |
| 125 Bufords. | 133 Lithia. | 113 White Post. |
| 153 Clifton Forge. | 96 Nottoway C. H. | 96 Wilson's Depot |
| 153 Cloverdale. | 96 Plains. | |
- * Henrico, 25 2 Richmond.
 - * Indian Rock (N. M.) 40 3 Richmond.
 - * Lairds, (N. M.), 40 3 Richmond.
 - * Lee Hall, 30 2 Richmond.
 - * New Market, Nelson Co., (N. M.) 25 2 Richmond.
 - * Salisbury, (N. M.), 40 3 Richmond.
 - * Wilton (N. M.) 50 3 Richmond.
 - * Yorktown, 45 3 Richmond.

WASHINGTON TERRITORY.

- | | | |
|----------------|------------------|---------------|
| 784 Carbonado. | 727 Prescott. | 722 So Texas. |
| 978 Marshall. | 774 Skagit City. | 738 Tuckel. |

WEST VIRGINIA.

- * Janalew, † 50 4 Wheeling or Parkersburg.
- * Lost Creek, † 50 4 Wheeling or Parkersburg.
- * Talcott, (N. M.) 25 2 Greenbrier, W. S. Spgs. or 50 3 Huntington.
- * Weston, † 50 4 Wheeling or Parkersburg.
- * Winifrede Juno., (N. M.) 30 2 Greenbrier, W. S. Spgs. or 45 3 Huntington.

† Charge for three extra words in messages to these offices; and accept only prepaid day messages.

WISCONSIN.

- | | | |
|---------------------|----------------------|--------------------|
| 845 Barneveld. | 355 Livingston. | 845 Sauk City. |
| 306 Calhoun. | 825 London. | 806 Spring Meadow. |
| 825 Cottage Grove. | 326 Marshall. | 326 Sullivan. |
| 306 Doussman. | 845 Merrill's Land'g | 854 Superior. |
| 840 Eden, Fond du | 806 No. Greenfield. | 862 Superior Juno. |
| Lac. Co. | 839 Tellico Sta. | 859 Summit Lake. |
| 839 Elmhorst. | 845 Prairie du Sac. | 854 Twin Bluffs |
| 852 Hayward. | 345 Richland City. | 850 Tunnel City. |
| 825 Jefferson Juno. | Ch. Lone Rock. | 855 Turtle Lake. |
| 839 Kempter. | 847 Rudolph. | 306 Wailes. |
- * Bailey's Harbor 25 2 Horn's Pier.
 - * Big Suamico, 15 0 by telephone Green Bay.
 - * Cary, 25 2 Eau Claire.
 - * Downsville, 25 2 Eau Claire.
 - * Dunville, 25 2 Eau Claire.
 - * Durand, 25 2 Eau Claire.
 - * Jacksonport, 25 2 Horn's pier.
 - * Lawrence, 25 2 Eau Claire.
 - * Meridean, 25 2 Eau Claire.
 - * Porterville, 25 2 Eau Claire.
 - * Shawtown, 25 2 Eau Claire.
 - * Sturgeon Bay Canal, 25 2 Horn's Pier.
 - * St. Josephs Pier, 25 2 Horn's Pier.
 - * Whitefish Bay, Door Co., 25 2 Horn's Pier.

WYOMING.

- 973 Fossil.

- 551 Harper.

NORVIN GREEN,
President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, July 15, 1882.

To all Transfer Agents and offices.

On July 15th, 1882, Omaha, Neb., Office was advanced from Class B. to Class A. 2.

On August 1st, 1882, Warren, Pa., Office will be advanced from Class C. to Class B., and on same date Belleville, Ill., will be added to the list of transfer offices in Class C. and assigned to C. Catlin's district.

Managers will correct their lists accordingly.

NORVIN GREEN,
President.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, July 15, 1882.

Business Franks Nos. N 915 issued on account of Pittsburg, Cincinnati & St. Louis Railway, N652 Boston, Hoosac Tunnel & Western Railway, and L 284 Old Colony Steamboat Co. have been lost.

Managers will please take them up, if presented, and return them to this Office for cancellation.

JNO. VAN HORNE,
Vice President.

RAILWAY GRADES AND DISTANCES.

In an argument lately presented to the Advisory Commission of the trunk line railroads, touching the question of rates for freight traffic, Mr. E. H. Walker, statistician of the New York Produce Exchange, submitted some interesting and valuable figures relative to the grades upon our principal East and West railways. He finds that the distance from Chicago New York by the Michigan Central, Canada Southern and New York Central is 979 miles; by the Lake Shore and Michigan Southern and the Canada Southern, 980 miles; by the Erie, 974 miles, and by the Pennsylvania, 912 miles. The distance from Chicago to Philadelphia by the Pennsylvania is 822 miles, and from Chicago to Baltimore by the Baltimore and Ohio is 840 miles, and by the Pennsylvania is 807 miles. The ascending grades on the Baltimore and Ohio going west from Baltimore are 231 miles, with an average ascent of 24 feet per mile, and the ascending grades going east from Wheeling, for 148 miles, average 30 feet to the mile. On account of a lack of data the gradients of the 461 miles between Wheeling and Chicago cannot be given, but Mr. Walker says it is not probable that they are less in crossing the States of Ohio, Indiana, and Illinois, about midway between the lakes and the Ohio River, than the roads passing near the level of the lakes—they are probably much more. Wheeling is 379 miles distant from Baltimore by the Baltimore and Ohio, and is 645 4-10 feet above the sea level. Wilson's Summit, 221 miles west of Baltimore, and 158 miles east of Wheeling, is 2,620 feet above the sea level.

By the Pennsylvania Railroad, Pittsburg is 354 miles from Philadelphia, and is 736 feet above tide-water. The summit of the Alleghenies, 2,154 feet above the sea level, is at Gallatin, 250 miles west of Philadelphia, and 104 miles east of Pittsburg. Harrisburg, 105 miles west of Philadelphia, is 313 feet above the sea level. From Harrisburg to Philadelphia, for the distance of 105 miles, the gradients are irregular, and range from 5 feet to 43 feet to the mile. The gradients from Philadelphia to New York, 90 miles, are light nearly the entire distance, with none exceeding 26 feet to the mile.

The grades from Spruce Creek, 215 miles west of Philadelphia, and 770 feet above the sea level, to Gallatin, 250 miles west of Philadelphia and 40 miles from Spruce Creek, show a rise from 770 to 2 154 feet, being for 10 miles from 59 feet minimum to 95 feet maximum per mile. The gradients from Pittsburg to Chicago, 468 miles, probably considerably exceed those of the lines of road nearer Lake Erie.

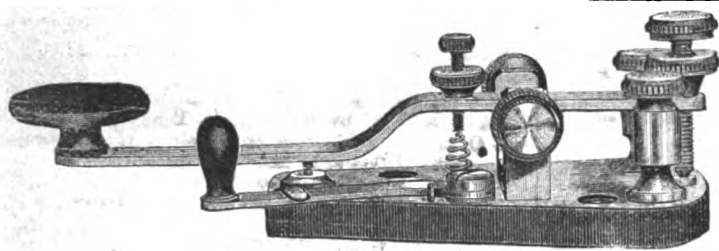
By the Erie Railroad, the distance from Jersey City to Salamanca, 1,390 feet above the sea level, is 413 miles and to Dunkirk, 482 feet above the sea level is 456½ miles. The summit between Jersey City and Dunkirk is at Tip Top, 1,783 feet above sea level, and 345 miles west of Jersey City and 111½ miles east of Dunkirk. The gradients of this railway from Salamanca to Chicago will probably compare very favorably with either the Pennsylvania or the Baltimore and Ohio Railway. Port Jervis, 88 miles west of Jersey City, is 441 feet above tide level.

The gradients of the Central line are more favorable than either of the other roads. Those of the Hudson River division are very little more than those of the Hudson River itself. The greatest elevation going west on the New York Central is from 17 feet above tide level near Albany to 341 feet between Albany and Schoenectady. Buffalo is 577 feet above the tide level. Batavia, 32½ miles from Buffalo, is 908 feet above tide level, which marks a rise in that distance of 331 feet, or about ten feet to the mile. From Batavia to Rochester there is a descending grade from 908 to 513 feet above tide level. From Rochester to Seneca River there are generally descending grades, from 513 above tide level at Rochester to 379 feet at Seneca River. From Seneca River to Syracuse there is a rising grade from 379 to 407 feet above tide. From Syracuse to Manlius there is a slightly rising grade from 407 to 413 feet above tide level. From Manlius to Wampsville there is a rising grade from 413 to 448 feet above tide level. From Wampsville to Green's Corners there is a rising grade from 448 to 488 above tide level. From Green's Corners to Rome there is a descending grade from 488 to 439 above tide level. There is a descending grade from Rome, 439 feet above tide, to 287 feet above tide at Schoenectady. From Schoenectady there is a rising grade in 11 miles from 287 to 315 feet above tide level, and then a descending grade for 11 miles to Albany 17 feet above tide level. The Canada Southern Railway is nearly as level as the waters of Lake Erie. There are no heavy grades on the Michigan Central or the Lake Shore and Michigan Southern roads. The level of the latter road nearly conforms to the level of the waters of Lake Erie. During the navigation season the trunk lines utilize the water transportation from Western lake ports to Buffalo, Erie, and Sandusky. Continuing, Mr. Walker says that railway engineer experts calculate that in operating a railway every foot of gradients makes an additional cost in the operating expenses, compared with the cost of operating a water level road. If this is so, the roads having the heavy grades are many miles longer than the New York Central or the Erie road. The distance from Chicago to Baltimore in lineal length is 134 to 140 miles less than to New York, and to Philadelphia is 152 to 158 miles less than to New York. The gradients of the Baltimore and Ohio and Pennsylvania roads are, however, many feet greater than the Erie or the New York Central—very much more than the difference in the length of the roads.

The Eastern Telegraph Company have obtained a firman from the Sultan of Turkey authorizing it to lay a submarine cable between Malta and Tripoli.

PARTRICK & CARTER'S SPECIALTIES.

PERFECTION AT LAST!



The "Acme Steel Lever Key"

For beauty of design, lightness, easy working, durability, and for fast-acting surpasses all other Keys ever made.

Price, by mail to any part of the United States or Canada, \$3 00.

This Key has a hard rubber base, with top connections, and is entirely nickel plated, and has received the endorsement of hundreds of operators as being the **perfection of all Keys**.

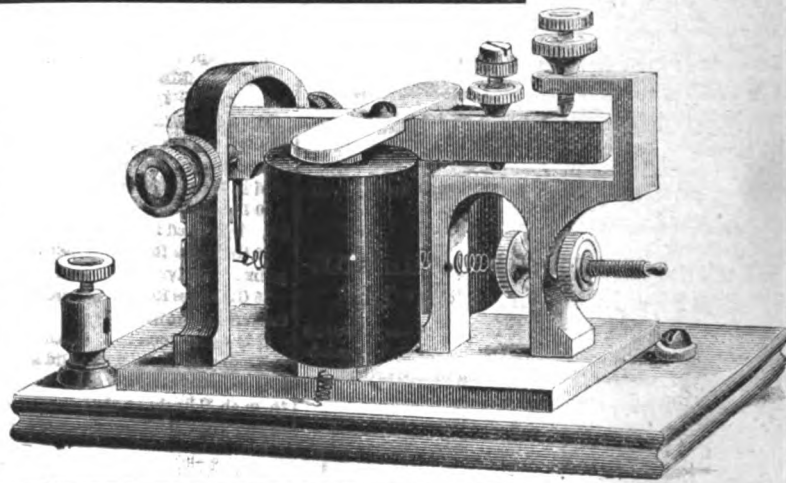
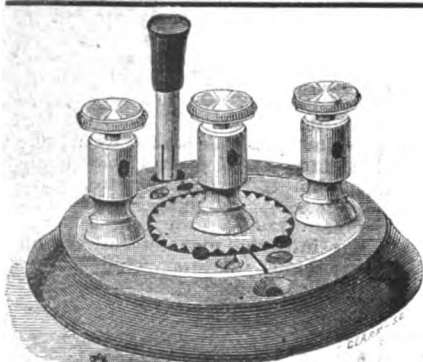
We have always been foremost in the production of "TELEGRAPHIC SPECIALTIES" and challenge the world in our line of manufactures to surpass our goods for cheapness, durability, finish and general workmanship.

We offer in addition to this splendid Key, our other specialties, as follows:

The New Giant Sounder Perfected.

Price, \$5.00, by mail.

Patented February 16, 1875, and the only patent ever granted embodying the principles contained in the "GIANT SOUNDER," and which is absolutely owned and controlled by us.



The Champion Lightning Arrester and Cut-Out.

Price, \$1.25, by mail.

This Lightning Arrester, Cut-Out and Ground-Switch combined, of which we are the originators, has been extensively copied and imitated but never equalled.

Premium Learners' Apparatus

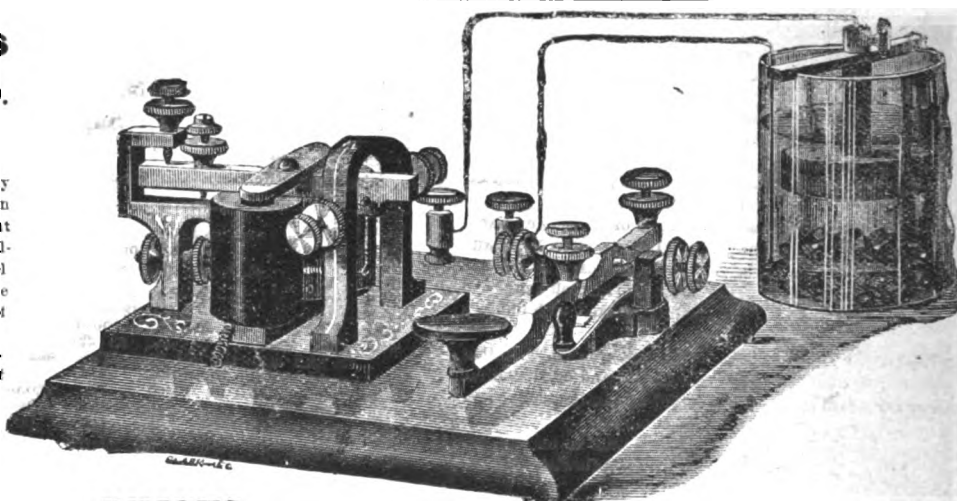
\$5.00 Or Short Line Instrument. \$5.00.

Not the Cheapest, but Guaranteed the Best!

THE PREMIUM LEARNERS' APPARATUS is manufactured especially to meet the demand for learners and for short lines of from one to ten miles in length. The outfit for a learner comprises the New Giant Sounder (Perfected), and the New Curved Key, placed upon a fine walnut base, one cell of Callaud Battery, Ohemica's, Office Wire, and an excellent Book of Instruction. Hundreds of young men and ladies have learned the art of Telegraphing with these Instruments and Book of Instruction without any other teacher.

Our Book of Instruction, which accompanies this instrument, contains the alphabet, with Examples and Lessons especially adapted to meet the wants of the beginner.

We Guarantee our Instruments as Represented.



PRICES.

| | |
|---|--------|
| Complete Outfit, Money in advance..... | \$5.00 |
| Instrument, without Battery, Money in advance..... | 4.20 |
| of 1 to 15 miles..... | 5.00 |
| Premium Sounder, Separate Base, Money in advance..... | 2.50 |
| Premium Key..... | 1.75 |
| Cell of Battery, Complete, Money in advance..... | .80 |
| Insulators, Porcelain, with Screws, Money in advance..... | .06 |
| No. 14 Gal Iron Wire, per mile..... | 10.00 |
| Extra Zincs for Battery, each..... | .25 |

| | |
|--|-----------|
| Extra Coppers for Battery, each, Money in advance..... | .15 |
| " Hangers..... | .10 |
| " Jars..... | .35 |
| Small Office Wire, per foot..... | 1/2 cent. |
| Premium Learners' Instrument, Key and Sounder entirely Nickel-plated, without Battery..... | 5.20 |
| Complete Nickel-plated Instrument, with Battery, etc..... | 6.00 |
| " Sounder, Separate Base..... | 5.25 |
| " Key..... | 2.00 |
| Instruction Book..... | .25 |

Battery Jars cannot be sent by mail.

Instruments without Battery, sent by mail, 55 cents extra. Remit by P. O. Money Order, Draft, Registered Letter or Express.

All of the above instruments we were the first to manufacture and put before the public, and we will guarantee the best goods for the least money, and know this is the verdict of the Telegraphic Profession.

Send for Catalogues and Circulars before purchasing elsewhere, and get the best manufactured.

PARTRICK & CARTER,

Manufacturers of the Best Telegraphic Instruments and Supplies,
114 South Second Street, Philadelphia, Pa.

A GREAT OFFER.

To Superintendents, Managers, Purchasing Agents
and others having on hand

Worn Out, Damaged or Useless Morse Keys,

We will, until further notice, furnish our

New Steel Lever Keys

in exchange for all old keys for a cash difference of \$1.66 each. This price applies to any number of keys, no matter in what condition the old ones may be. They must be delivered to us, in packages plainly marked KEYS, with all charges PREPAID, and remittance should accompany the orders, except from Superintendents and Purchasing Agents of well-known Companies.

Now is the time, while the offer holds good, to get together all of your

Used-up and "Bad" Keys

and exchange them for splendid New Ones. See description and advertisement of Steel Lever Key. Send for circular.

J. H. BUNNELL & CO.,

112 Liberty Street, N. Y.

FREE!

Complete Instruction in Telegraphy

If you wish to know all about learning Telegraphy, constructing and operating Short Lines of Telegraph, &c., send your address, by postal card or letter, and get J. H. Bunnell & Co.'s Manual of Instruction for Learners of Telegraphy, latest edition, which we will send

FREE OF CHARGE,

to all who apply, by mail or otherwise.

It is the plainest and best book of instruction in Telegraphy ever published, being fully complete in description, explanation and illustrations.

J. H. Bunnell & Co.,

112 Liberty Street, N. Y.

THE AMERICAN BELL TELEPHONE COMPANY.

W. H. FORBES, President, W. K. DRIVER, Treasurer,

THOS. N. VAIL, General Manager.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, and under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses.

This Company desires to arrange with as of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

KERITE INSULATED

TELEGRAPH WIRES AND CABLES

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

in earth, air or water and is recommended and endorsed by all the leading men in the telegraphic profession.

THE

DURABLE QUALITIES OF KERITE

RECOMMEND IT AS THE

CHEAPEST AND MOST ECONOMICAL

insulator for all telegraphic purposes

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation furnished at short notice.

INSULATED WIRE

of sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

further particulars address,

A. G. DAY,

Holder Patent,

120 Broadway, New York.

E. BACCHINI, General Agent,

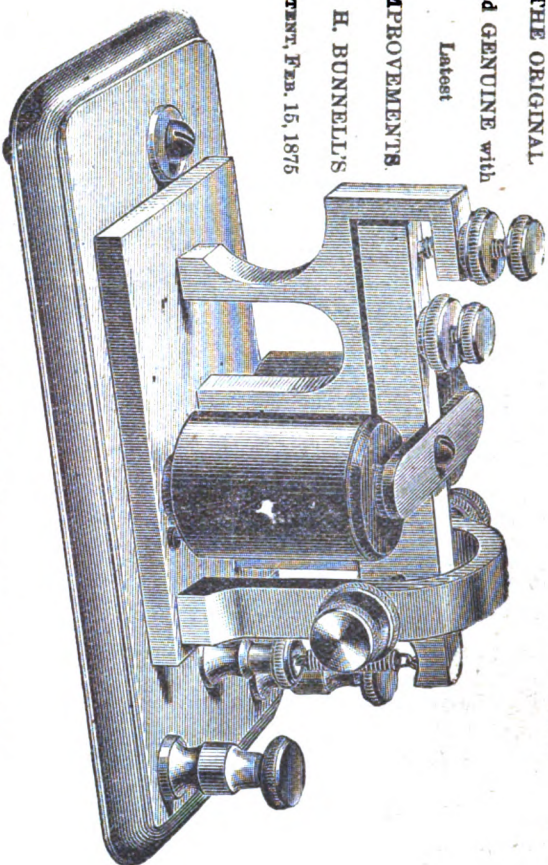
Another Great Reduction in Prices ! !

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS

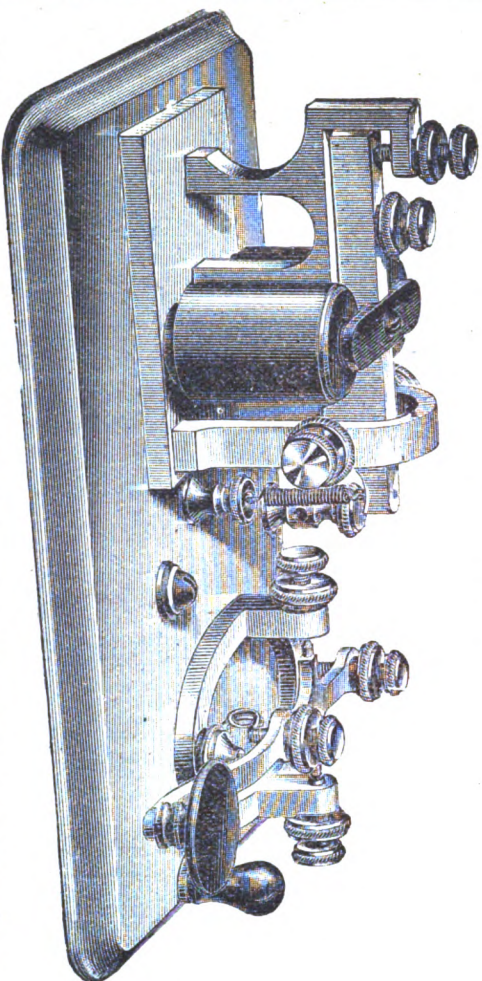
J. H. BUNNELL'S

PATENT FEB. 15, 1875



THE GIANT SOUNDER—UNEQUALLED ! \$4.00.

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$4.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



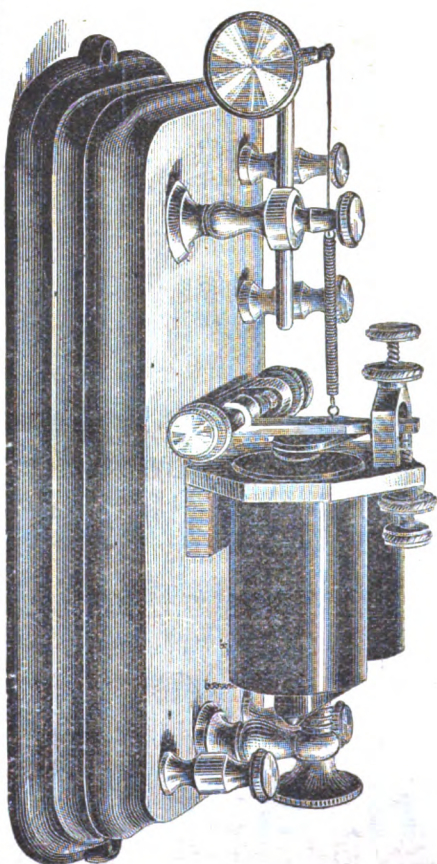
GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET : \$7.50.

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$7.50, carefully boxed and sent by mail, prepaid, to any part of the United States.

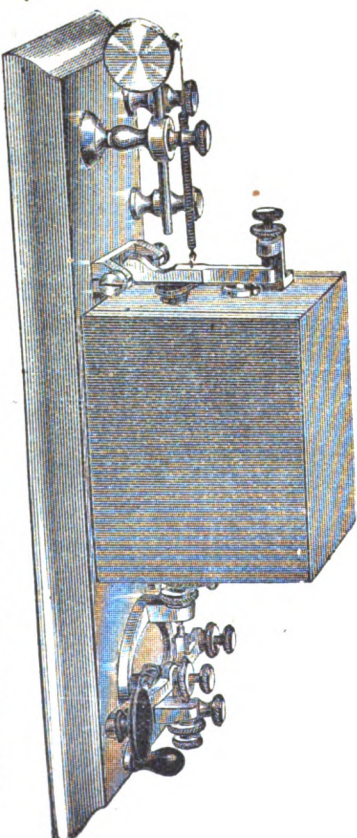
All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.



\$7.50.

FIRST CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.
150 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Surface, Extension Adjustment. Price, \$7.50.



\$11.00.

BOX SOUNDING RELAY AND STEEL LEVER KEY.

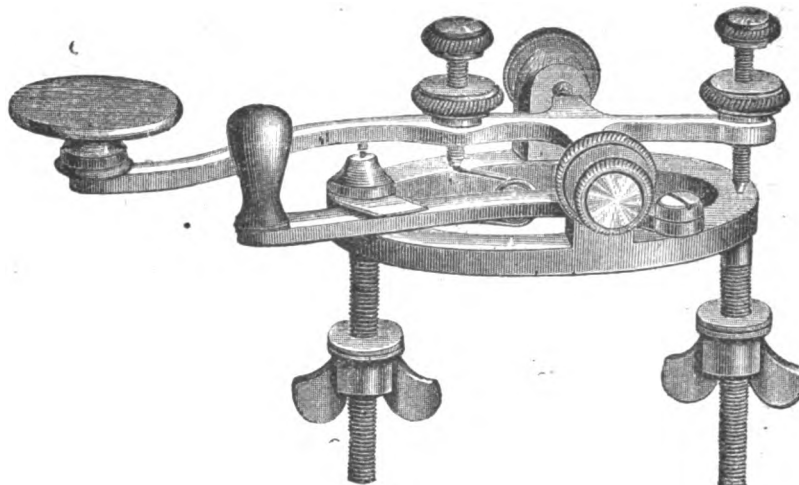
COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire.
Price, with Steel Lever Key on base, \$11.00; without Key, \$8.50.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER SOLID TRUNNION KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:

The Lever is *only one-half* the weight of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Our Steel Lever Solid Trunnion Key

is now well known throughout the United States and Canadas as being the most satisfactory, durable and perfect key for Morse Telegraphing.

Its great popularity since its first introduction has caused many attempts to produce a key having at least equal merit. But, after two years' trial in thousands of different places, it still remains

“A Number 1,” Ahead of all,

while its competitors drop out and cease to be heard from.

Various absurd contrivances will, no doubt, continue to be put forward as being equal or better keys, but we would say to all who wish to possess a perfect instrument that

“The Bunnell Steel Lever Key”

is beyond all comparison,

THE BEST.

J. H. BUNNELL & CO.,

FIRST-CLASS TELEGRAPH INSTRUMENTS & MATERIALS OF EVERY DESCRIPTION,
112 Liberty Street, New York,

CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1858.)

109 COURT STREET, BOSTON, MASS.

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells, District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

Geo. WASHINGTON, Jr., Pres. RALPH BAGLEY, V. Pres. & Treas.

U. H. JACKSON, Gen'l Manager. ADAM T. BOWMAN, Secretary.

HENRY SMYDER, General Agent,

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of

The Interlocking Switch and Signal Co., of Harrisburg, Pa.

sole Owners and Manufacturers of the only practically successful

SYSTEM OF OPERATING RAILROAD SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches, Signals and Gates by Levers, Hydraulics, Pneumatics or Electricity.

Also, Manufacturers of Frogs, Crossings, Switches and Switch Stands.

Plans, estimates and detailed descriptions, together with references to apparatus in practical operation, will be furnished upon application.

ESTABLISHED 1820.

ALFRED F. MOORE,

(SUCCESSOR OF JOSEPH MOORE & SONS)

MANUFACTURER OF

INSULATED TELEGRAPH WIRES,

200 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

INSURANCE AND OFFICE WIRES. FLEXIBLE CORDS. ANNUNCIATORS

AND BURGALAR ALARM WIRES. ELEVATOR CABLES.

All wire used is thoroughly tested for conductivity, therefore ensuring purity and regularity of resistance.

SOLE MANUFACTURERS OF

NICKERSON'S PATENT TIP.

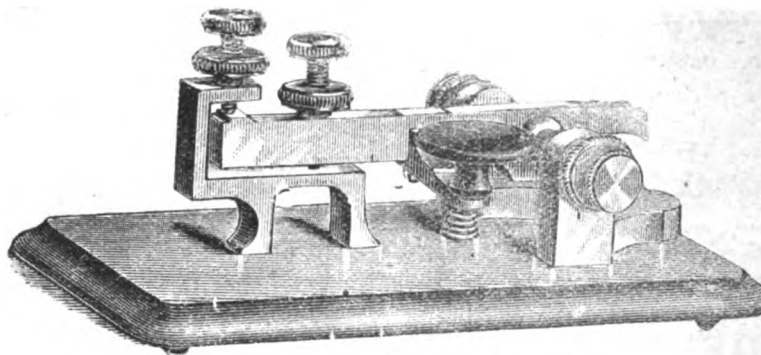
FOR FLEXIBLE CORDS.

Descriptive Circulars furnished upon application.

NEW MECHANICAL

TELEGRAPH INSTRUMENT.

PATENTED APRIL 4, 1882.



COMBINED KEY AND SOUNDER.

No BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is always ready for use.

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or registered letter.

J. H. BUNNELL & CO.,

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

ILLUSTRATED CATALOGUES
OF MAY, 1882?

If not, send your address by postal card or letter and you will get one by return mail

It contains Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instruments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

Don't Read This!

NEW 1882 ILLUSTRATED INSTRUCTION BOOK. It is the MOST COMPLETE OPERATOR'S INSTRUCTION BOOK in the world. C. E. JONES & BRO.: Dear Sirs:—Instruction Book received. O. K., and many thanks. It is worth five times what it cost. If a person could not learn to be an operator after studying it, they had better give up. Yours truly, A. L. JAMES, Tipton, Tulare County, Cal.

Now! Right Now! while fresh in your mind, is the best time to send your order, before you misplace this paper and forget our address, and your opportunity is gone. Remittances preferred in currency, 1c. or 2c. stamps.

C. E. JONES & BRO.,

MANUFACTURERS AND DEALERS IN

TELEGRAPH, TELEPHONE AND ELECTRICAL SUPPLIES.

NO. 51 WEST FOURTH STREET, CINCINNATI, OHIO.

WESTERN ELECTRIC MANUFACTURING COMPANY.

220-232 KINKEAD STREET, CHICAGO.

53-55 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES.

Insulated Copper Wire, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ARSON STAGER, President. ERIC M. BARTON, V.-Pres.

ELIENNA GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE. |
|---|--------|--------|
| I—Complete Set of Catalogues..... | 226 | 20c. |
| II—Telegraph Instruments and Supplies..... | 64 | 6c. |
| IV—Insulated Wire (included in II) | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 32 | 3c. |
| VI—Electro-Medical Apparatus..... | 32 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 32 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 3c. |
| XI—Magnets for Mills..... | 20 | 3c. |
| Str Wm. Thomson's Nautical Instruments.... | 24 | 3c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,
AND

PLAIN AND OILED WIRE OF SUPERIOR
QUALITY,

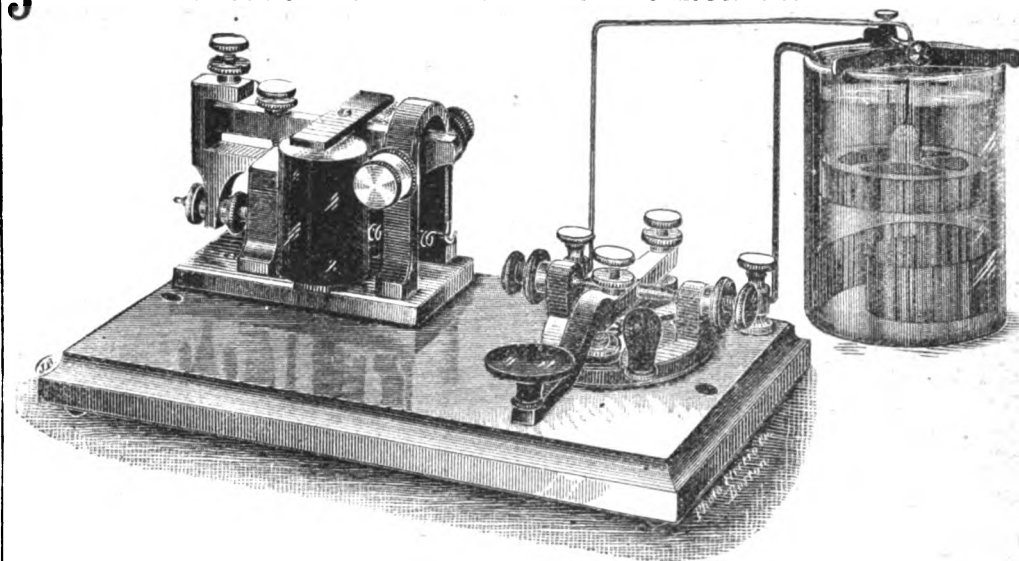
FROM SWEDISH CHARCOAL AND B B IRON.

BUT ONE JOINT PER BUNDLE

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



PRICE FOR THE COMPLETE "GEM" LEARNERS' OUTFIT, \$4.20.

Consisting of the above large-sized Sounder and Key, a good Cell of Calland Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument made that has nicely finished brass Sounder and Key Levers with perfect adjustments for both.*

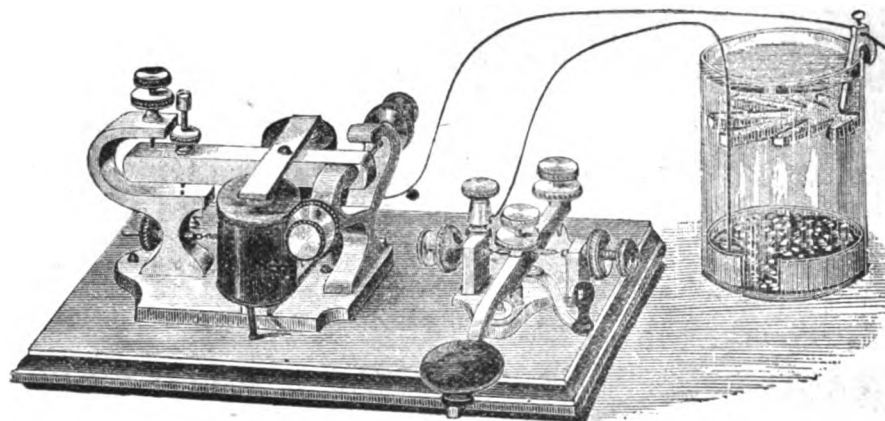
| | | | | |
|---|--------|-----------------------------|--------------------|--------|
| Price for Complete Outfit..... | \$3.75 | Price for Instrument alone, | 1 to 15 miles..... | \$1.50 |
| " " Instrument alone..... | 3.00 | " " " " " " | " " " " " " | " " |
| " " Instrument alone, by mail, postpaid.... | 3.50 | by mail, postpaid..... | | 4.05 |

SEND FOR CIRCULAR

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,

No. 30 HANOVER STREET, BOSTON, MASS.

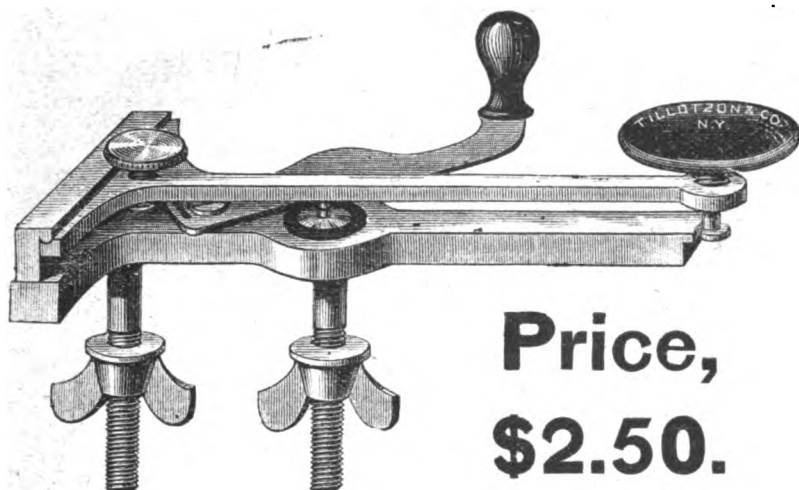


No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of Sounder, Key, either on 1 base or separate, 5x7, Calland Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent O. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

A. B. LYMAN, 36 South Water St., Cleveland, O.

THE "VICTOR" TELEGRAPH KEY.



**Price,
\$2.50.**

PATENT APPLIED FOR.

*The Greatest Improvement in Telegraph Keys
ever made.*

THE EASIEST WORKING.

THE MOST POSITIVE CONTACT.

The Lightest Lever.

The Most Perfect in Construction.

No Trunnion Connections.

No Side Motion to Lever.

No Back Adjusting Screw.

**The Neatest, Nicest, Handiest and Best Key
in the World.**

Since the earliest days of Morse Telegraphy there has been little or no radical change in Telegraph Keys until the invention of the Victor Key.

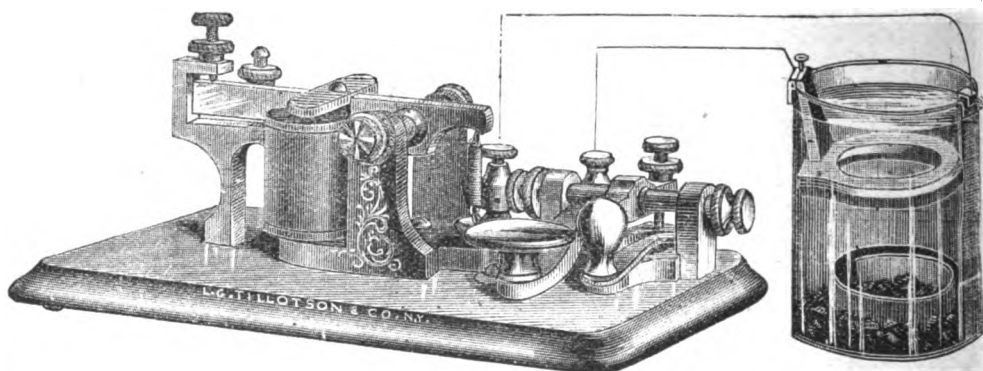
Telegraphers who take hold of the "Victor" Key will at once notice that there are but two points of adjustment to regulate. These are the play of the lever and the stiffness of the spring. There are no loose trunnions to tighten up, and no tight trunnions to loosen. The lever can never move to one side or the other; and the point can never be worn into wedge shape. The play of the lever must of necessity be directly up and down, without side motion; and consequently the points must always strike fairly and squarely. The imperfect trunnion connections of all old style keys are completely done away with in the "Victor," and the five minutes' labor of the "relief" operator in twisting adjustment screws to get his key lever to work "to suit" are at once ended. These are the most prominent points that will present themselves to the Telegrapher who uses the "Victor" key for the first time. Add thereto the light STEEL lever, which also prevents wearing of the connection, and the long leverage, and you have the two leading advantages claimed for the most perfectly improved of modern telegraph keys. By a turn of the knob to the left the play of the lever is decreased, or by a turn to the right it is increased, thus avoiding the imperfect set screw adjustment heretofore universally in use. These advantages present themselves so clearly and emphatically to every telegrapher that this key has only to be tried to receive the commendation already universally accorded it by every telegraph man who has examined it, which is "THE BEST KEY I EVER SAW."

To enable all to test the merits of this great invention, we will, on receipt of price, \$2.50; send, post-paid, by registered mail, to any part of the United States or Canada, a sample VICTOR KEY.

\$3.75. Great Reduction in Price \$3.75.

OF THE CELEBRATED

HOME LEARNERS' TELEGRAPH INSTRUMENTS



Owing to the great demand for these popular instruments, we have been compelled to enlarge our facilities for their production, and are now making them in such quantities as to admit of a considerable reduction in price, which reduction we now give our customers the advantage of. All of these Instruments will be manufactured as heretofore in the best manner, and they will be found the best Student's Apparatus in the market.

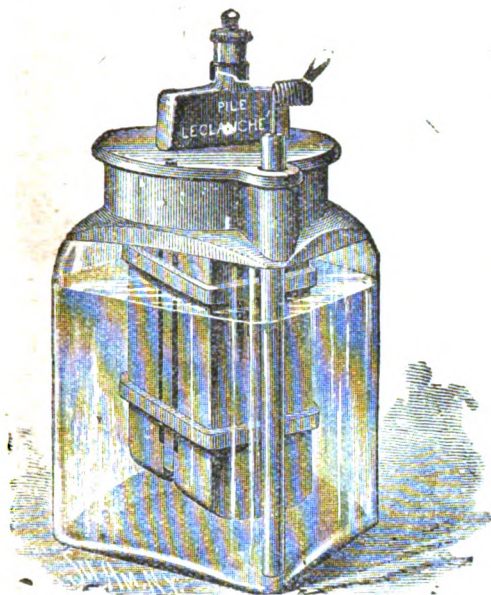
For the above Complete and Perfect Sounder and Key Combined, on mahogany base, including Battery, Chemicals, Wire, Book of Instruction and everything necessary for a first-class Telegraph Outfit for the Student's use, for practice at home, or for operating all Short Lines of Telegraph, net cash..... \$3.75
Instruments for short circuit, without Battery..... 3.00
Same by mail, post paid..... 3.50

| | |
|---|--------|
| Instruments without Battery, wound with fine wire, for lines 1 to 15 miles..... | \$3.75 |
| Same by mail, post-paid..... | 4.25 |
| Cell of Battery..... | .65 |
| Instruction Book..... | .30 |
| Galvanized Telegraph Wire, per 100 feet..... | .30 |
| Remit by Postal Money Order, Draft or Registered Letter, | |

MANUFACTURED ONLY BY

L. G. TILLOTSON,

*Manufacturers and Dealers in TELEGRAPH AND TELEPHONE SUPPLIES of Every Description,
Nos. 5 and 7 Dey Street, New York.*

LECLANCHE BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company,
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones,

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Placques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of Infringements and Worthless Imitations.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity
Zinc and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,

149 West 18th St., New York.

Or L. G. TILLOTSON & CO.,

5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FINISHED

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLES, ETC.

OFFICE AND FACTORY: 87 STEWART STREET,

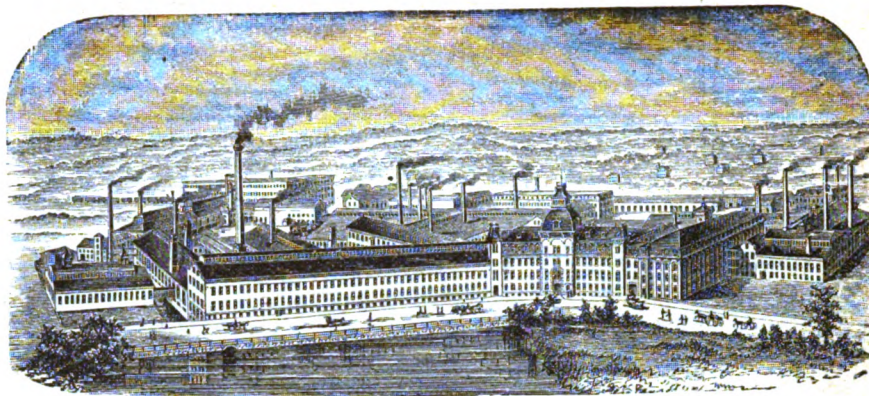
PROVIDENCE, R. I.

W. H. SAWYER, Electrician and Supl.

TELEGRAPH WIRE.

WASHBURN & MOEN MANUFACTURING COMPANY.

ESTABLISHED 1861. CAPITAL \$1,800,000.



WORCESTER, MASS.

21 OLIVET STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequaled in that particular.
Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

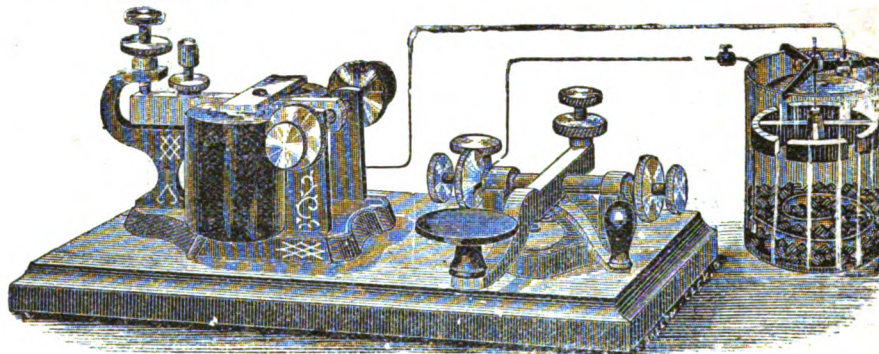
(In connection with the DOUBLE SHEETING FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.
N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

EUREKA OUTFIT NO. 2.

Price \$4.00.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

SENT ON RECEIPT OF \$4.00; OR SENT C. O. D. \$3.00 IF \$1.00 IS SENT WITH THE ORDER.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

144 Superior Street, Cleveland.

Operators' Cramps cured by



**LITTLE GIANT
FRENCH BATTERY**

Relieves Rheumatism
and all Nervous Com-
plaints. Supersedes all
others. Send for circular.

C. E. JONES & BRO.
Cincinnati, Ohio.

CEDAR TELEGRAPH POLES,

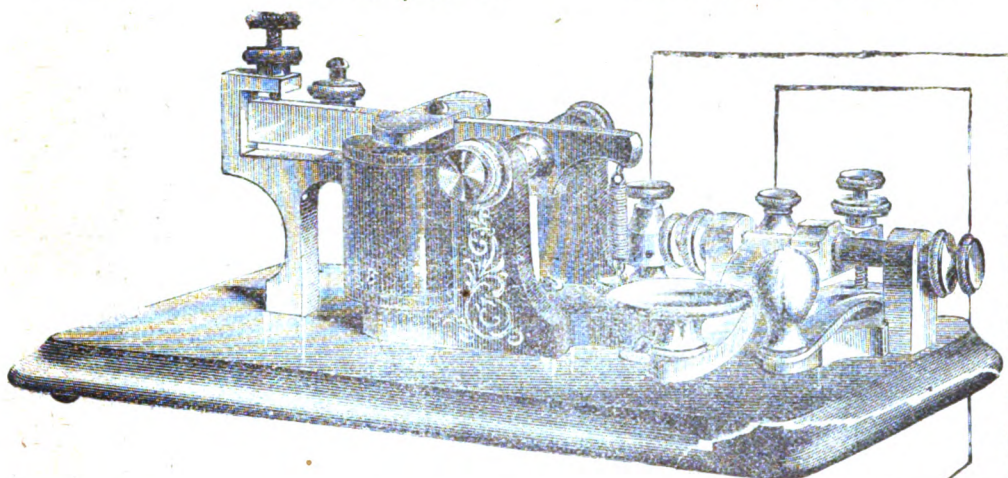
50,000 for SALE, by

H. G. RIPLEY,

East Saginaw, Mich.

The "Morse" Learners' Outfit \$3.75.

**GREAT
REDUCTION
IN
PRICE !!
THE BEST.**



THE BEST.

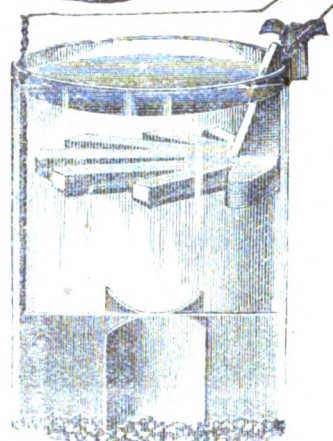
Price, \$3.75, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.
 "Morse" instrument alone, without battery..... \$3.00
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 3.75
 Cell of battery complete..... .65
 "Morse" Learners' instrument, without battery, sent by mail..... 3.50
 (Battery cannot be sent by mail.)

Instruction Book **FREE.**

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



The "Morse"
 Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners' Instruments for short or long lines, from a few feet up to 20 miles in length,
YET OFFERED!

**You are SURE of getting
 THE BEST THAT IS MADE
 IF YOU SELECT THE "MORSE."**

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.

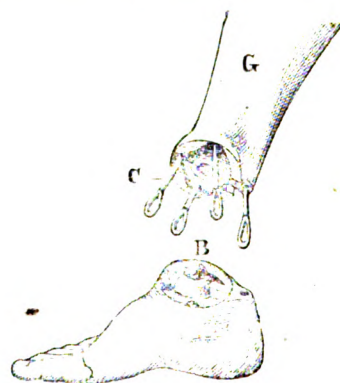
SHORTHAND Writing thoroughly taught
 by mail or personally.
 Situations procured for pupils when consistent
 and for circular W. G. CHAFFEE, Oswego, N.Y.

I will teach any operator the Corresponding Style of Phonography, who will sell a Calligraph for me.



YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "75," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 either designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys, Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents; also Embellished Keys 25 for 25 cents. Samples of Operators Cards 10 cents. 50 New and laughable Illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 2 c. 25 side-splitting Comic Cards, 20c. Morocco card cases, two pockets, 10c. 100 finely printed letter heads, \$1.00. 10 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 10c. **Agents Wanted** to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also satin fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and Slipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200, no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from 3 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,
F. P. MUNN, CLYDE, Wayne Co., N. Y.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
 With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.
GEO. R. FULLER,
 Successor to Dr. D. BLY, Rochester, N. Y.

IT PAYS to sell our Hand Printing Rubber Stamps.
 Samples Free. **C. FOLJAMBE,**
 Successor to G. A. HARPER & BRO. Cleveland, O.

CARBON.

FOR SALE from 50 to 75 tons of Carbon,
 made in clay gas retorts.

Address, **W. H. ALLEN,**
 113 Market Street,
 Philadelphia.

Cornell University.

Departments of

**Civil Engineering,
 Mechanical Engineering,
 and Architecture.**

Entrance examinations June 12 and Sept. 19. For Annual Register containing requirements for admission and courses of instruction, with details as to the systems pursued, apply to the **PRESIDENT OF THE UNIVERSITY**, or the **DEANS OF THE DEPARTMENTS**, at ITHACA, N. Y.

HALBERT E. PAINE, late Comm'r Patents. **STORY B. LADD**

PAINE & LADD,

Solicitors of Patents and Attorneys in Patent Cases,
Washington, D. C.

Found at Last.

A CHEAP

COUNTER CLIP,

(PATENT APPLIED FOR.)

CHEAPER THAN PASTE.

Blanks Removed Without Tearing.

Price, post-paid, 15 cents. Per doz., post-paid, \$1.50.
 Discounts to the Trade or to Telegraph Co.s, in quantities.
 Larger sizes made to screw to wall, for Paper Bags, Wrapping Paper, &c. Address,

W. W. PRICHARD,
 Ironton, Ohio.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, AUGUST 20, 1882.

WHOLE NO. 350.

(From Wiedemann's Annalen.)

ON THE ELECTRIC RESISTANCE OF THE GASES.

By E. EDLUND.

It appears that the electric resistance of gases is in many respects different from that of solid and liquid bodies. We shall here consider these differences and attempt to give their explanation.

1. In order that the current of an electro-motor may traverse a liquid or solid conductor, it is by no means necessary that the electro-motive force should possess a certain strength. However small such force may be the current passes through the conductor, although the strength of the current decreases in proportion as the electro-motive force is reduced or the resistance increased. The current ceases only with the electromotive force. With gases the relation is quite different. If the current is to traverse a gaseous body the electromotive force must produce a certain tension at the electrodes, the magnitude of which depends on the nature, the density, and the temperature of the gas, and which must not fall below a certain limit. If the tension falls below this limit the gas appears as a perfect insulator.

2. The quantity of heat which the current produces in a solid or liquid body is well known to be proportional to the square of the strength of the current. In gases, however, this quantity of heat is as the first power of the strength of the current. (See *Pogg. Ann.*, 145, p. 237, and *Wiedemann's Beiblätter*, 2, p. 720.)

3. In solid and liquid conductors the quantity of heat developed by the current is, other things being equal, inversely as the section of the conductor. In gases the heat-quantity is quite independent of the section of the gaseous column traversed.

4. In solid and liquid bodies the resistance is inversely as the section of the conductor. Wiedemann has shown experimentally that the tension at the electrodes which is necessary to send the electricity of a Holtz machine through a cylindrical tube filled with diluted gas does not depend on the diameter of the tube, the resistance of the gas being independent of the section of the gaseous column. Schultz had previously observed that the tension was almost the same in two tubes, one of which was 0.5 and the other 16 mm. in diameter.

5. In solid and liquid conductors the difference between the electroscopic tensions at two points of the conduction is proportional to the resistance between these two points multiplied by the strength of the current. Warren de la Rue and Hugo Müller have shown, on the other hand, that the tension in expanded gases is quite independent of the strength of the current. These physicists caused the strength of the current to vary between wide limits without being able to perceive the slightest difference in the tension. Hittorf came to a similar result by another

process, and concluded prematurely that the resistance of a gaseous column must be inversely proportional to the strength of the current.

6. Some years ago E. Becquerel showed that the gases become conductive when raised to the temperature of redness. The current of a single element can traverse the gaseous column if the temperature is sufficiently high. Becquerel has drawn from his researches another conclusion, to which we must draw attention. If the strength of the current traversing a gaseous column is caused to vary by the introduction of various rheostatic resistances, the resistance of the gaseous column seems to be inversely proportional to the strength of the current. If E is the electromotive force of the electro-motor, i and i_1 the strengths of the current, r and r_1 the resistances of the solid and liquid conductors introduced into the track of conduction, and z and z_1 the resistances of the gaseous column corresponding to the two intensities of the current, Becquerel, according to Ohm's law, puts

$$i = \frac{E}{r + z} \text{ and } i_1 = \frac{E}{r_1 + z_1}$$

If the gaseous column is shut out of the circuit, and if m and m_1 are the resistances which must be introduced in order to obtain the intensities of the current i and i_1 , we have

$$i = \frac{E}{m} \text{ and } i_1 = \frac{E}{m_1}$$

Hence it follows that $m - r = z$, and $m_1 - r_1 = z_1$. If the calculation is carried out thus, we come really, as Becquerel's experiments prove, to the curious result that the resistance of gases is inversely proportional to the strength of the current.

The differences between solid and liquid bodies on the one hand, and gaseous bodies on the other, can be readily explained upon the unitary theory of electric phenomena proposed by the author.

The circumstance that the electromotive force, or the electric tension on the electrodes, does not require to exceed a certain limit in order that the current may traverse a solid or liquid conductor is due, according to this theory, to the fact that the true resistance which those conductors oppose to the current is proportional to the strength of such current. The demonstration of this law no longer applies in the case of gaseous bodies. As already remarked, in gases the electric tension must have a certain value, according to each case that the current may penetrate. The resistance of the gases cannot therefore be proportional to the strength of the current; nor can we assume, with Becquerel or Hittorf, that the resistance is inversely proportional to the strength of the current, otherwise the resistance of a gaseous column traversed by an infinitely small current would be excessively great. In an electric discharge, or in a closed galvanic circuit, the current is at the first moment infinitely small. Hence it would follow that the resistance at the same moment would

be so great that the formation of the current could not take place. We must therefore assume that in gases—provided that the current occasions no change of temperature, &c.—the resistance is independent of the strength of the current.

According to the unitary theory the resistance is determined by the pressure which the conductor, exerts upon the unit section in opposition to the propagation of the electric current. We denote this counter-pressure in a column of gas, the section and length of which are equal to unity, by k . In a column of the section a , the whole counter-pressure against the transmission of the steam = ka . (In a liquid or solid body the entire counter-pressure = k , i signifying the entire strength of the current, and k the resistance for the unit of the strength of the current.) If h is the speed of propagation of the current, i.e., the distance which it traverses in a unit of time, i the strength of the current, and δ a constant common to all bodies, we have, according to the theory, $i = \delta a h$. If ka is multiplied by h ,

or $\frac{i}{\delta a}$, the product $\frac{ki}{\delta}$ is proportional to the me-

chanical work performed by the current in the unit of time; and if this product is multiplied by the heat-equivalent of the unit of work, we obtain an expression proportional to the quantity of heat evolved in the unit of time. It follows, therefore, from the theory that this quantity of heat is proportional to the strength of the current, but independent of the diameter of the gaseous column.

As to the resistance is determined by the pressure which the conductor opposes per unit of section to the propagation of the current, and as in gases this counter-pressure is independent of the strength of the current, it is evident that the resistance has nothing to do with the magnitude of the section.

The difference between the electroscopic tensions at two points of the conductor of a current is, according to the unitary theory, proportional to the real resistance of the conductor between these points. As this resistance in gases is independent of the strength of the current, this must also be the case with the difference of the electroscopic tensions.

If r is the essential resistance in a closed circuit consisting merely of solid and liquid conductors, l the length of track of conduction, n the section of the polar plates, E the electromotive force, and i the strength of the current, we have, according to the unitary theory for calculating the strength of the current, the differential equation,

$$l \frac{di}{dt} = nE - nr i,$$

from which we obtain by integration Ohm's law

$$i = \frac{E}{r}$$

**PUBLISHED MONTHLY, ON 30TH OF EACH MONTH, AT
125 BROADWAY.**

Superiority in advance.

One Copy, one year, postage included..... \$ 1.50
One Copy, six months, postage included..... .75
Single Copies. 15 cents.

ADVERTISING RATES

| | |
|--------------------------------------|----------------|
| One Inch space—each insertion | \$ 2.00 |
| Half Inch " " | 1.00 |
| Quarter Column, " " | 4.00 |
| Half " " | 8.00 |
| One " " | 16.00 |

Only charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, AUGUST 20, 1882.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, August 10, 1882.

In addition to the list published in the JOURNAL of February 1st, giving the names of the places at which American Union franks for 1882 are good, add the name of Lackawanna and Bloomsburg Junction, Pa.

THOS. T. ECKERT,
General Manager.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, August 17, 1882.

BUSINESS franks Nos. M. 903, on account Canada Southern Ry., N. 835, Wabash, St. L. and Pacific Ry., N. 806, N. York, Ontario and Western Ry., 855, St. Louis and San Francisco R. R., N. 809, East Tenn., Va. and Ga. R. R. and M. 288, Delaware, Lack and Western R. R., have been reported lost.

Managers are requested to take them up on presentation and return to this office for cancellation.

JNO. VAN HORNE.
Vice President.

TELEGRAPH SCHOOLS.

THIS subject is ever one of importance to telegraph operators as well as to those who contemplate becoming such at some future time. The peculiar education needed for the good qualification of an operator can only be acquired by experience, and the prevailing questions of aspirants are how and where can this be had if they are debarred the observation and use of instruments in a telegraph office, where new beginners are not permitted to enter? Offices on regular telegraph lines cannot be bothered by mere learners, and the office rules will not permit it. The

Such a school, like any other good school, may be difficult to find, but they exist nevertheless; so do poor schools of that character, but it is for the interest of all instructors that they should be as practical and thorough as the ability of the instructors can devise. There are many of them worthy of the confidence of those who contemplate becoming telegraph operators.

Much can be learned by self instruction, and there are many instances where persons have become fair operators by the use of instruments and lines improvised for the purpose, with the aid of a book of instructions for beginners, but a school is generally preferable, and the student should also try to learn all he can outside of that, so that if he has an opportunity he may be far enough advanced to take some place where thorough knowledge is not required or expected from him. In large cities there are many private lines where such an operator will be gladly accepted.

Those who contemplate attending a telegraph school should soon begin to be about it, as they usually open in the early autumn.

THE editorial notice of the recent great work by William B. Plum, LL.B., in two volumes, giving the history of the Military Telegraph during our Civil War, is deferred for want of time and space to give a proper notice of it. We hope to be able to do so in our next issue.

THE ORIGIN OF THUNDERSTORMS.

On the 7th of July, Mr. B. G. Jenkins, F.R.A.S., read an interesting paper on this subject at a meeting of the Dulwich College Geological Club, held at the Old College. According to the author a thunderstorm is generally regarded as a manifestation of atmospheric electricity. Electricity is without doubt actively present, but its duty is, he maintained, largely to act as a match to produce the chemical unions of which the thunder is the audible effect. If a thunderstorm is the result of an excess of electricity in the atmosphere, it is remarkable that they should be so prevalent in June, when the atmospheric electricity is at a minimum, and not happen in January, when it is at a maximum. That moisture is not the cause of thunderstorms is evident, for moisture in the winter months increases atmospheric electricity, but diminishes it in summer. Besides, thunderstorms are much fewer in number and less violent over the oceans than over the continents. The vast quantities of water in the rapidly-formed thunder clouds are the effect and in no way the cause of the storm. Count Volta showed that gases emit positive electricity when being condensed, and in this and the consequent rapid formation of dense clouds Mr. Jenkins considered the true explanation lay. The condensation was due to a chemical change produced in the union of the oxygen and nitrogen of the atmosphere with hydrogen. The two former are abundant; the difficulty is to account for a large and sudden supply of the latter. There are, however, reasons for believing that the outside layer of our atmosphere is largely composed of hydrogen, and that under certain atmospheric conditions portions of this vast layer are

whirled down into the mixture of oxygen and nitrogen around and above us. The mere friction of the particles would be sufficient to produce an electric spark, causing a large portion of the hydrogen to unite with oxygen, forming water; another to unite with nitrogen forming ammonia; and another to unite with oxygen and nitrogen to form nitric acid. Each great flash is followed by a sudden downpour of rain, and especially of hail, indicating by the great change of temperature some vast chemical union. This can be no other than the formation of water, which, as is well known, would be accompanied by flame and explosion. The light produced in the sky during a thunderstorm has been divided into three kinds—first, forked lightning; second, sheet lightning; third, ball lightning. The first only of these, he held, was true electricity. The second is the most frequent, and appears to be produced inside the cloud, lighting up the mass, being almost wholly flame, due to the combustion of hydrogen in oxygen, and other chemical changes—the thunder being not so much the noise of the electric discharge as the report of the explosions taking place during the chemical union. Ball lightning is probably not electricity, but a mass of gas in intense ignition. The comparative harmlessness of the last two would seem to indicate their non-electric character.

TRANSMISSION OF ELECTRICAL POWER.

EXPERIMENTS hitherto made on the transmission of power by electricity have always been over short distances, and by means of cables of exceptionally low resistance. From six to eight-horse power of work is the maximum amount that has been transmitted over distances upwards of three miles. Mr. Marcel Deprez has, however, quite recently made some interesting experiments which point to greater achievements in the near future. With Gramme machines of the small type, weighing about 220 pounds, modified in accordance with the principles which he has already indicated, he obtained a useful work of about 260 foot-pounds (37 kgm.); the resistance interposed between the motor and the receiver being 786 ohms, representing a distance of about 50 miles of ordinary telegraph wire. This was effected without any sparking at the brushes, and in keeping the machine quite cool, while there were no special precautions taken to insulate the conductors. The yield or rendering of work was 25 per cent., but M. Deprez hopes to increase this efficiency in subsequent experiments.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, August 20, 1882.

To all offices on Western Union lines:

CHANGES.

The following changes which have been made since July 20, 1882, should be entered in the Tariff Book as they will not be republished.

ALABAMA.

267 Mott's Mill, reopened.

CALIFORNIA.

790 Frank'in. S. Co., closed.

710 New Hope, reopened.

COLORADO.

554 Anishapa, reopened.

DAKOTA.

947 Cantonment, changed to 947 Little Missouri.

FLORIDA.

* * Enterprise, now by mail from Sanford. Erase "750 Sanford."

315 Millview, reopened as * Millview, 25 2 Pensacola.
* Sorrento, closed.

GEORGIA.

* * New Holland Springs, now * New Holland Springs, 10 0 Gainesville.

* * White Sulphur Springs, now * White Sulphur Springs 25 0 Gainesville.

ILLINOIS.

307 Auburn, Cook Co., closed.
* Brunt, changed to * Big Rock.
357 Lennox, W. Co., changed to 357 Larchland.
310 Roland, reopened.

IOWA.

366 No. McGregor, closed.
396 Wells, changed to 396 Wellsburg.

KENTUCKY.

* * Dover, now 100 0 Ripley, O.
291 Owensboro June., changed to 291 Central City.
233 Silver Lake, changed to 233 Earlinger.

LOUISIANA.

* Coughatta, reopened. 50 3 Prudhomme. Krase " 50 4 Minden."

Until further notice Farmersville business will be sent and checked via Monroe. No change in "other" line rate.
403 Trenton, closed.

MAINE.

16 Phillips, closed.
16 Strong, closed.

MARYLAND.

* * Ocean City, now 54 Ocean City, Summer office.

MASSACHUSETTS.

25 E. Douglass, reopened.
* * Atlantic House, Beachmont Sta., Pavilion House and Robinson Crusoe House, given under Revere Beach in Tariff Book, are now 25 0 by telephone, from Chelsea. Other places on the Beach 50 cents.

MEXICO.

* Monterey 124 11 Brownsville, Tex., or 50 4 Laredo, Tex.
* Salinas Victoria 140 11 Brownsville, Tex., or 50 4 Laredo, Tex.

MICHIGAN.

250 Colwell, closed.
220 Hamilton, Genesee Co., changed to 220 Swartz Creek.
* * Mackinaw or Mackinaw Island, now 25 0 special delivery or mail Mackinaw City. Erase "by mail Oheboygan."
MISSISSIPPI.

* Refuge, closed.

MISSOURI.

429 Aurora is in Lawrence Co.
418 Bedford, closed.
* Jacks n, Cape G. Co., reopened. Tariff for "other" lines 25 2 Cape Girardeau.

NEW BRUNSWICK.

3 Bloomfield, closed.

NEW HAMPSHIRE.

Greenland, Rye and Stratham now each 1.50 delivery from North Hampton.

NEW JERSEY.

52 Middle Valley. Ok. German Valley.

NEW YORK.

* Bloomville and Hobart now 25 2 from Delhi only. Erase the Stamford route.

40 Browns Sta. is in Ulster Co.
37 Croton Lake, closed.
45 Harts Falls, closed.
40 Lebanon Springs, reopened.
45 Schaghticoke, erase the words "Ok. Harts Falls."

The following are delivery charges from West New Brighton to the places named:

| | | | |
|------------------|------|------------------|------|
| Bulls Head, | 50 0 | New Springville, | 75 0 |
| Elm Park, | 25 0 | Port Richmond, | 15 0 |
| Graniteville, | 50 0 | Troisville, | 75 0 |
| Mariners Harbor, | 50 0 | | |

NORTH CAROLINA.

Gibson's Store is now 125 Gibson's Store. P. O. care Laure Hill. Erase "25 cents more than Old Hundred, etc."

OHIO.

170 Belmont, reopened.
151 Goulds, closed.
242 Harrisburg, Montgomery Co., closed.
* W. Elkton, closed.
* Spencer's is in Guernsey Co.
* Winchester, Preble Co., closed.

The following changes in telephone charges from Ironton, O., have been made:

| | | | |
|---------------------------|------|-----------------------|------|
| Bartel's Station, | 25 2 | Mt. Vernon Furnace, | 25 2 |
| Buckhorn Furnace, | 30 2 | New Castle Coal Mine, | 25 2 |
| Burlington, Lawrence Co., | 25 2 | Ohio Furnace, | 25 2 |
| | | Olive Furnace, | 30 2 |

| | | | |
|-------------------|------|---------------------|------|
| Bradrickville, | 25 2 | Proctorsville, | 25 2 |
| Centre sta., | 25 2 | Pine Grove Furnace, | 25 2 |
| Etna Furnace, | 25 2 | Rockwood, | 25 2 |
| Hecia Furnace, | 25 2 | South Point, | 25 2 |
| Lawrence Furnace, | 25 2 | | |

PENNSYLVANIA.

151 Finleyville, reopened.
85 Gettysburg Springs, reopened.
66 Llewellyn, closed.
141 Lemont closed.
* * Newberry, L. Co., now 84 Newberry, L. Co.
* Shippack, should read * Skippack.
Erase from the Tar ff Book the words, "Tariff same as Philadelphia," printed after each of the following: Belmont, Phila. Co., Chestnut Hill, Frankford, Germantown, Germantown June, Hestonville, Manayunk, Phila. Co., Paschalville, Port Richmond, No. Phila. Drove Yards and Tioga, Phila. Co.

SOUTH CAROLINA.

165 Grahamville, changed to 165 Ridgeland.

TEXAS.

654 Carson, reopened.
491 Morales, closed.
480 Oakwoods, reopened.

The office at Longview, Tex., was destroyed by fire. Managers of offices which exchanged messages with Longview between July 1st and 14th inclusive, are requested to send Longview copies of such messages.

VIRGINIA.

* * Chincoteague Island, now * Chincoteague Island, 25 1 Philadelphia, Pa.

103 Jordans White Sulphur Springs, reopened as * Jordans White Sulphur Springs, 25 2 Winchester.

* Riverville, closed.
153 Sweet Chalybeate Springs, reopened.

WEST VIRGINIA.

* Cassville, now * * Cassville, 25 0 Louisa, Ky.

WISCONSIN.

316 Fayette, closed.

OFFICES HAVING SPECIAL SHEET "L"

Will erase Cornwall, N. Y., Meshoppen, Milan, Wyalusing and Wysauking Pa., from sheet "L" and charge thereto the Square or State rates; they will also add Auburn, Ind., to sheet "L" and make rate thereto same as to Auburn June., Ind.

CENTRAL AND SOUTH AMERICAN TELEGRAPH COMPANY
OPENING OF TELEGRAPHIC COMMUNICATION WITH
STATIONS ON THE WEST COAST OF CENTRAL AND
SOUTH AMERICA.

The lines and cables of the Central and South American Telegraph Co. are now in working order, although not yet ready for the acceptance of public business, and the announcement that messages may be taken for transmission may be expected on or before September 1, 1882. Notice of the day upon which messages may be accepted for transmission, will be given hereafter by special order.

The rules for the acceptance and treatment of messages to and from the Central and South American Co., are the same as those which govern messages to and from the Atlantic cables.

THE FOLLOWING ARE THE RATES PER WORD:

From all W. Union offices in the United States, except those in Texas and Louisiana, to

MEXICO.

Goatzacoalcos, 62 cents. Salina Cruz, 72 cents.

CENTRAL AMERICA.

SALVADOR.

La Libertad, 75 cents.

To other places in Salvador, named below, charge 5 cents per word in addition to the rate to La Libertad:

Armenia, Almendros, Acjutia, Ahuachapan, Atiquisaya, Comasagua, Cojunepeque, Chinameca, Chalchuapa, Citala, Chalatenango, Coatepeque, Gotera, Guajabal, Jucunapa, Jocoro, La Union, Lempas, Metapam, Nejapa, Olocuilta, Opico, Quezaltepeque, Izalco, Lihasco, Juayus, Sonsonate, Santa Ana, San Salvador, San Martin, Santa Tecla, Santa Rosa, San Miguel, San Vicente, Sensuntepeque, Sauce, San Andres, Suchitoto, Taxis, Totacatepeque, Usulután, Umana, Zacatecoluca, Zaragoza.

GUATEMALA.

To places in Guatemala, named below, charge 5 cents per word in addition to the rate to La Libertad:

Aduana (capital), Antigua, Amittul, Asuncion Mita, Chiquimulilla, Chiquimula, Chimaltenango, Coban, Chico, Guajiquila, Chichicatango, Cuyotenango, Champerico, Coatepec, Chiantla, Chingo, Chinautla, Escuintla Encuentros, Esquipulas, Guatemala, Gualan, Huehuetenango, Izabal, Japa, Jalpatag, Jutiapa, Las Marias, Mazatenango, Malaca-

tan, Mataquecuintla, Nenton, Naranjo, Ostuncalco, Palin, Palacio (capital), Petapa, Patzum, Parulul, Quiche, Quezaltenango, Retalhuleu, Rodeo, San Rafael, San Felipe, San Andres, Osuna, Santa Rosa, Santa Catarina, San Jose, San Agustin, Santo Domingo (capital) Santa Lucia, Solola, Sija, San Cristobal, San Pablo, San Marcos, San Pedro Hnula, Salama, Sacapulas, Tecpan, Tejutla, Tacana, Toconicapan, Villa Nueva, Zapaca, Zapotitan.

HONDURAS.

To places in Honduras, named below charge 5 cents per word in addition to the word rate to La Libertad:

Amapala, Comayagua, Cedros, Campamento, Cantarranas Choluteca, Danli, El Corpus, El Rosario, Gracias, Guinope, Intibuca, Juticalpa, Jocomico, Lucerna, La Paz, La Brea, Naranjito, Nacaome, Omas, Ocotepeque, Olanchito, Puerto Cortez, Proteccion, Potrerillo, Pespire, Santa Barbara, Santa Rosa San Pedro Sula, San Juan de Flores, San Jose, San Antonio Del Norte, San Antonio de Oriente, San Diego, Sabana Grande, Saco, San Miguel Guacapa, Sulaco, Sonaguera, Santa Maria, Talpetate, Tegucigalpa, Trujillo, Valle de Angeles, Yoro, Yucatan.

NICARAGUA.

San Juan del Sur, \$1.00

To other places in Nicaragua, named below, charge 5 cents per word in addition to the rate to San Juan del Sur:

Acayapa, Chichigalpa, Chinandega, Corinto, Esteli, Granada, Jinotega, Jinotepa, Juigalpa, La Libertad, Leon, Managua, Matagalpa, Masaya, Metapa, Nagarote, Nandaime, Ocotal, Rivas, Somotillo.

COSTA RICA.

To places in Costa Rica, named below, charge 5 cents per word in addition to the rate to San Juan del Sur.

Alajuela, Atenas, Bagaces, Cartago, Espartero, Grecia, Heredia, La Guardia, La Palma, Liberia, Puntarenas, Santa Cruz, San Jose, San Mateo, San Ramon, Taboga, Tempisque, Tres Rios.

SOUTH AMERICA.

NOTE.—Messages intended for transmission via this route to South American stations should be marked, in the check, "via Galveston." When no route is given messages will be forwarded as heretofore.

| | | | |
|---------|--------|-------------------|--------|
| Panama, | \$1.37 | Aspinwall, Colon, | \$1.42 |
|---------|--------|-------------------|--------|

U. S. COLOMBIA.

| | |
|---------------|------|
| Buenaventura, | 1.52 |
|---------------|------|

Bogota and other telegraph stations, 5 cents per word in addition to the rate to Buenaventura.

ECUADOR.

| | | | |
|----------------|------|------------|------|
| St. Elena Bay, | 1.77 | Guayaquil, | 1.77 |
|----------------|------|------------|------|

PERU.

| | | | |
|------------|------|-------------------|------|
| Arica, | 2.52 | Mollendo, | 2.47 |
| Arequipa, | 2.69 | Pabellon de Pica, | 2.68 |
| Callao, | 2.17 | Payta, | 1.92 |
| Huanillos, | 2.68 | Pisagua, | 2.68 |
| Iquique, | 2.57 | Tacna, | 2.63 |
| Lima, | 2.17 | | |

BOLIVIA.

| | |
|--------------|------|
| Antofagasta, | 2.72 |
|--------------|------|

CHILI.

| | | | |
|-------------|------|-------------|------|
| Caldera, | 2.82 | Huasco, | 2.98 |
| Carrizal, | 3.03 | Lota, | 3.18 |
| Chillan, | 3.18 | Ovalle, | 3.08 |
| Chanaral, | 2.93 | Santiago, | 3.18 |
| Cobija, | 2.88 | Serena, | 2.92 |
| Concepcion, | 3.18 | Talca, | 3.18 |
| Copipo, | 2.93 | Taltal, | 2.93 |
| Coquimbo, | 3.03 | Talcahuano, | 3.18 |
| Famaya, | 3.03 | Tocopilla, | 2.83 |
| Freirina, | 3.03 | Valdivia, | 3.18 |
| Guayacan, | 3.03 | Vallenar, | 3.07 |
| Higuera, | 3.03 | Valparaiso, | 3.03 |

From W. Union offices in Louisiana and Texas, to all Central and South American Telegraph Co's stations, 6 cents per word less than the rates given above.

From New Brunswick, Nova Scotia, Ontario, Quebec, Manitoba and British Columbia, 3 cents per word more than from offices north of Louisiana and Texas.

ATLANTIC CABLE.

Communication through the Shanghai and Amoy and the Amoy and Hong Kong cables is interrupted. Messages for Amoy will be sent via best means.

The cable between Rio Grande and Montevideo has been repaired.

Messages for Egypt, except to Khedive Government, must be written in plain language. In Khedive Government messages secret language is allowed.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in three columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

| | | |
|-----------------|----------------|-----------------|
| 318 Akron. | 323 Onba. | 267 Notasulga. |
| 285 Bangor. | 328 Epsa. | 324 Prichards. |
| 294 Briarfield. | 293 Falkville. | 266 Stock Mill. |
| 284 Calera. | | |

- * Alexander City, 40 3 (25 1 N. M. rate) Opelika.
- * Dadeville 40 3 (25 1 N. M. rate) Opelika.
- * Ft. Morgan, 75 5 Mobile.
- * Gainesville, 25 2 Epsa.
- * Goodwater, 40 3 (25 2 N. M. rate) Opelika.
- * Point Clear, 50 3 Mobile.
- * Round Mountain, free telephone, Collinsville.

ARIZONA.

| | | |
|--------------------|--------------------|-----------------|
| 646 Adonde. | 640 Dragon Summit. | 659 Holbrook. |
| 639 Bowie Station. | | 642 Picacho. |
| 660 Canon Diablo. | 660 Flagstaff. | 645 Sentinel. |
| 641 Contention. | 644 Gila Bend. | 645 Texas Hill. |
| | | 659 Winslow. |

- * Butte City, 50 4 Casa Grande.
- * Pinal, 50 4 (30 2 N. M. rate) Casa Grande.
- * Silver King 50 4 (30 2 N. M. rate) Casa Grande.

ARKANSAS.

| | | |
|------------------|----------------|----------------|
| 449 Brentwood. | 371 Nettleton. | 449 West Fork. |
| 371 Gainesville. | 381 Palestine. | 449 Winslow. |
| 371 Knobel. | 371 Parmley. | |
| 391 Jacksonport. | 401 Russell. | |

- * Warren 50 4 Pine Bluff.

BRITISH COLUMBIA.

- * Bentons, 50 3 Sumas.

CALIFORNIA.

| | | |
|---------------------|-------------------|---------------------|
| 300 Alameda Point. | 800 Decoto. | 826 Table Bluff. |
| | Ck. Alameda. | 799 Norman Station. |
| 827 Albion Mills. | 800 Ocean View. | 877 Whitesboro. |
| 791 Coopers switch. | 720 San Geronimo. | |

- * Bidwell's Bridge, 25 2 by telephone, Greenville.
- * Fall Brook, 40 3 San Diego.
- * Lafayette, 15 2 by telephone, Martinez.
- * Leesville, 50 3 Colusa.
- * Magalia, free, telephone, Oroville.
- * National City, 25 2 San Diego.
- * Walnut Creek, 15 2 by telephone, Martinez.

COLORADO.

| | | |
|-----------------------|------------------|--------------------------|
| 545 Agate. | 590 Holleys. | 634 Rockwood. |
| 546 Bennett. | 599 Hortense. | 628 Sargents. |
| 545 Boreas. | 623 Hot Springs. | 536 Sedgwick. |
| 623 Browns Canon. | 614 Ignacio. | 545 Snyder. |
| 540 Buffalo, Weld Co. | 540 Huff. | 558 South Pueblo. |
| 523 Calumet. | 628 Kezar. | Ok. Pueblo. |
| 552 Carr. | 552 La Salle. | 552 Stout. |
| 540 Crook. | 558 Oak Creek. | 599 Tennessee. |
| 545 Deuel. | 545 Orchard. | 592 Timpas. |
| 559 Earle. | 555 Pine Grove. | 599 Twin Lakes. |
| 541 First View. | 550 Pinon. | 599 Woodstock. |
| 545 Hardin. | 557 Red Cliff. | 569 Wootton, Ok. Morley. |

- * Akron, (N. M.) 65 4 Plattsmouth.
- * Alena 25 1 Gunnison.
- * Ashcroft (N. M.) 75 5 Gunnison.
- * Aspen (N. M.) 85 6 Gunnison.
- * Blair, (N. M.) 75 5 Plattsmouth, Neb.
- * Bonanza (N. M.) 25 2 Villa Grove.
- * Cosejón, 25 0 Antonito.
- * Eckley (N. M.) 60 4 Plattsmouth, Neb.
- * Elbert, (N. M.) 40 3 Denver.
- * Elizabeth, (N. M.) 25 2 Denver.
- * Empire, 25 2 telephone, Georgetown.
- * Franceville, (N. M.) 40 3 Denver.
- * Hyde, (N. M.) 60 4 Plattsmouth, Neb.
- * McDonnellville, (N. M.) 40 3 Denver.
- * Manitou June, (N. M.) 40 3 Denver.
- * Parkers, (N. M.) 25 2 Denver.
- * Platte Summit, 75 5 Plattsmouth, Neb.
- * Querida, 40 3 telephone, Silver Cliff.
- * Rock Springs, (N. M.) 65 4 Plattsmouth, Neb.
- * Saguache 25 2 (25 1 N. M.) Villa Grove.
- * Wray (N. M.) 65 4 Plattsmouth, Neb.

CONNECTICUT.

| | | |
|--------------------|----------------|----------------|
| 25 Goshen, W'dham. | 37 Sandy Hook. | 29 South Lyme. |
| | 37 Southford. | 37 Stepany. |
| 25 Hop River. | 37 Southbury. | 25 Thompson. |
| 25 No. Windham. | | |

- * Bridgewater, 20 0 by telephone, New Milford.
- * Nanboc, 30 3 Hartford.
- * Noroton, 10 0 by telephone, Stamford.
- * Sherman, 20 0 telephone, New Milford.
- * Warren, 20 0 by telephone, New Milford.
- * Whitneyville, 50 0 New Haven.
- * Winnipauk, 10 0 by telephone, Norwalk.

DAKOTA.

| | | |
|---------------------|----------------------|------------------|
| 947 Antelope. | 947 Green River. | 920 Northville. |
| 848 Big Stone City. | 809 Henry. | 915 Ordway. |
| 940 Canning. | 890 Hillsboro. | 903 Preston. |
| 916 Chamberlain. | 926 Hitchcock. | 926 Pukwana. |
| 909 Clark Centre. | 947 Houston. | 930 Rex. |
| 913 Cleveland. | 896 Kindred. | 924 Steele Sta. |
| 947 Dickinson. | 947 Little Missouri. | 924 Sterling. |
| 933 Eagle Nest. | 895 Mayville. | 933 Sweetb. lar. |
| 913 Eldridge. | 926 Miller. | 930 Wessington. |
| 908 Ellendale. | 898 Montrose. | 926 Yorktown. |
| 890 Gardner. | 915 Mt. Vernon. | |

- * Crook City, 50 2 by telephone, Deadwood.
- * Colman, 55 4 La Crosse, Wis., or 25 3 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Dell Rapids, 55 4 La Crosse, Wis., or 25 3 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Egan, 55 4 La Crosse, Wis., or 25 3 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Fort Misset, N. 25 1 Webster.
- * Grandin Farm, free, telephone, Hillsboro.
- * Howard, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Madison, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Pine Ridge Agency, 150 9 Cheyenne, Wy.
- * Poplar River, 25 1 Bismarck.
- * Rosebud Agency, 175 10 Cheyenne, Wy.
- * Spear Fish, 50 2 by telephone, Deadwood.
- * Sturgis City, 50 2 by telephone, Deadwood.
- * Wentworth, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.

DELAWARE.

| | | |
|-----------------|-------------|-------------------------|
| 67 Bear. | 67 Hartley. | 60 Ross, Summer office. |
| 60 Broad Creek. | 67 Klamend. | 60 Woodside. |

FLORIDA.

- * Blackwater, 50 5 Pensacola.
- * Blue Pond, 75 5, (50 3 N. M. rate) Lake City.
- * Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
- * Highland, 50 4 Lake City.
- * Kissimmee (N. M.) 150 10 Lake City.
- * Micanopy 75 5 (50 3 N. M. rate, Lake City).
- * Orange Lake 75 5 (50 3 N. M. rate) Lake City.
- * Paola, (N. M.) 100 6 Lake City.
- * Perry Junction, 75 5, (50 3 N. M. rate) Lake City.
- * Teocul, (N. M.) 50 3 Lake City.
- * Waite Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

| | | |
|-----------------|--------------------|---------------------|
| 197 Chauncy. | 176 Johnston. | 246 Roswell. |
| 207 Dubois. | 226 Lawrenceville. | 197 Surrency. |
| 246 East Point. | 186 Midville. | 226 Suwanee. |
| 187 Folkston. | 186 Perkins June. | 187 Victoria Mills. |

- * Abbeville (N. M.) 40 3 Ft. Gaines.
- * Arlington, 40 3 Ft. Gaines.
- * Blakely, 40 3 Ft. Gaines.
- * Oedartown, 30 2 Cartersville.
- * Rockmart (N. M.) 25 2 Cartersville.
- * Senola, (N. M.) 25 2 Newnan.

IDAHO.

| | | |
|-------------------|-------------------|----------------|
| 578 Arimo. | 970 Dry Lake. | 970 Bathrum. |
| 970 Clark's Fork. | 970 Hope Station. | 970 Sand Point |

ILLINOIS.

| | | |
|----------------------|-----------------------|------------------------------|
| 316 Algonquin. | 318 Gays. | 319 Parriah. |
| 300 Allendale. | 308 Goodwine. | 319 Richard. |
| 307 Alpine. | 317 Gravel Bank. | 316 Richmond. |
| 336 Anawan. | 318 Hazel Dell. | 309 Rose Hill, Jasper Co. |
| 299 Barton. | 308 Henderson. | |
| 328 Beecher City. | 317 Hills Park. | 309 St. Marie. |
| 299 Effingham Co. | 299 Indian la. | 299 Sidell. |
| 299 Belknap. | 357 Knox Ck. Galva. | 297 State Line, Lake Co. |
| 298 Bondfield. | 357 Lorchland. | |
| 336 Bureau, Ok. | 327 Lodge. | 318 Stockton. |
| Princeton. | 308 Lyford. | 346 Union Grove. |
| 308 Cissna Park. | 307 Maunheim. | 348 Wann. |
| 347 Oliver Ck. Cuba. | 309 Monrovia, Effing. | 307 Wayne. |
| 309 Claytonville. | ham Co. | 309 West Liberty. |
| 336 County Line Ck. | 326 Nachusa. | 318 Westfield. |
| Kewanee. | 307 New Lebanon. | 299 Wetzel. |
| 336 Dugan, Ok. Ke. | 307 North Evanston. | 309 Wheeler. |
| 368 Epperson, Ok. | 347 Oakford. | 368 Wrights, Ok. Greenfield. |
| 307 Dummer. | 329 Olmstead. | 387 Zanesville. |
| 346 Forreston June. | 358 Palmyra. | |
| | 309 Palosine. | |

- * Albia, 25 2 Huntington, Ind.
- * Ansonia 25 2 Stre tor.
- * Belmont, 25 2 Huntington, Ind.
- * Big rock 25 2 Aurora or Forreston.
- * Kernan 25 2 Streator.
- * Keenes 25 2 Huntington, Ind.

INDIANA.

| | | |
|------------------------|----------------------|-------------------------|
| 252 Briant. | 270 Grangers. | 281 New Ross. |
| 211 Buena Vista. | 300 Ingles. | 261 Ossian. |
| 298 Cedar Lake, Sum. | 263 Letts Corner. | 290 Paxton. |
| mer office. | 298 Lowell, Lake Co. | 298 Rose Lawn. |
| 251 Centerton. | 241 Maples. | 253 Sa dinia Cross-ing. |
| 300 Cynthia. | 262 Maxwell. | 271 Sedalia. |
| 252 Daleville. | 262 Milroy. | 271 Sycamore. |
| 280 English Lake. | 280 Monon. | 800 Wadesville. |
| 299 Fountain, Vigo Co. | 300 New Harmony. | 253 Westport. |
| | 300 Owensville. | 262 Warrington. |

- * Birdseye, 25 2 Huntington.
- * Boston 25 2 Hunti. gburg.
- * Burnville, 15 1, telephone Columbus.

- * Clifford, 15 1, telephone Columbus.
- * Crandall, 25 2 Huntington.
- * Ferdinand. By mail, Ferdinand Station.
- * Hartford, Crawford Co., 25 2 Huntington.
- * Illinois, free, by telephone, Dana.
- * Lowell, Bartholomew Co. 15 1, telephone Columbus.
- * Miltown, 25 2 Huntington.
- * Oakland City, 25 2 Huntington.
- * St. Louis Crossing 15 1, telephone Columbus.
- * St. Meinrad. By mail, Ferdinand Station.
- * Wayne City, 25 2 Huntington.
- * Winslow, 25 2 Huntington.

IOWA.

| | | |
|-----------------------|----------------------|----------------------------|
| 463 Alton. | 416 Harcourt. | 417 Polo. |
| 426 Angus. | 444 Havelock. | 463 Remsen. |
| 387 Ashton. | 435 Henderson, Ok. | 416 Renwick. |
| 425 Bate. | Hastings. | 346 Riggs, Ok. Pres-ton. |
| 426 Bancroft. | 426 Herndon. | 425 Butena. |
| 417 Bethany June. | 425 Irvington. | 425 Rutland. |
| Ck. Lamoni. | 386 Jackson. | Ck. Waucoma, 473 railr. |
| 425 Bradgate. | 416 Kamrar. | 367 Sand Spring, Ok. |
| 346 Browns, Ok. Pres. | 416 Kalamazoo. | Anamosa. |
| 367 Buffalo. | 435 Kalo. | 397 Selma. |
| 425 Burt. | 443 Kirkman. | 444 Sioux Rapids. |
| 3-8 Charlestown. | 388 La Orew. | 455 Solomon. |
| 426 Clive. | 435 Lake City. | 876 Spirit Lake. |
| 426 Cooper. | 407 Laurel. | 455 Stonnett, Ok. Red Oak. |
| 426 Dakota City. | 444 Laurens. | 416 Thor. |
| 367 Donahue, Ok. | 397 Libertyville. | 416 Thrall. |
| Dixon. | 435 Lohrville. | 407 Van Oleva. |
| 876 Esterville. | 387 Long Point. | 417 Van Wert. |
| 417 Exline. | 444 Marathon. | 367 Viola, Ok. Stone City. |
| 367 Fairport. | 367 Montpelier. | 386 Walsburg. |
| 435 Farnhamville. | 465 North Boro. | 426 West Bend. |
| 454 Fletcher. | 417 Numa. | 426 Yae. |
| 416 Galt. | 455 Page Centre, Ok. | |
| 407 Girard. | Charinda. | |
| 454 Gray. | 444 Peterson. | |
| 454 Hardy. | 416 Pilot Mound. | |

KANSAS.

| | | |
|--|---------------------|-------------------------------|
| 517 Alum Creek. | 507 Hazelton. | 475 North Topeka, Ok. Topeka. |
| 466 Argentine. | 503 Horton. | 476 Piqua. |
| 465 Baker. | 466 Huron. | 518 Strong City. |
| 466 Barclay. | 457 La Harpe. | 476 Toronto. |
| 457 Bronson. | 465 Lancaster. | 476 Uniontown. |
| 521 Chase. | 475 Larken. | 518 Valley Center. |
| 527 Cleveland. | 527 Lenora. | 475 Wakarusa. |
| 517 Clifton. | 507 Leonard. | 447 Waseca June. |
| 527 Collier. | 507 Miltonvale. | 466 Westphalia. |
| 503 Crawford. | 457 Moran. | 448 Mulberry Grove. |
| 527 Edmond. | 448 Mulberry Grove. | 465 Willis. |
| 456 Kismet. | 456 North Lawrence. | 416 Yates Center. |
| 514 Galva. | Ok. Lawrence. | |
| * Cottonwood Falls, 50 0 Strong City. | | |
| * Enterprise, 15 0, by telephone, Detroit. | | |

KENTUCKY.

| | | |
|--------------------|-----------------|-----------------------|
| 263 Bloomfield. | 233 Earling. | 288 Rocky Hill. |
| 291 Central City. | 263 Finchville. | 263 South Louisville. |
| 263 Crescent Hill. | 263 Glencoe. | 263 Taylorsville. |
| 243 Donerail. | 243 Pine Hill. | 339 Wickliffe. |

- * Clay Lick, 25 1 by telephone, Worthville.
- * Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Huntington, W. Va.
- * Eastern June, 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
- * East Ky. June, 35 2 Huntington, W. Va.
- * Flemingsburg, 15 4 by telephone, Johnson June.
- * Glisville, 25 1 by telephone, Worthville.
- * Gratz, 25 1 by telephone, W. Va.
- * Kilgore, 30 2 Huntington, W. Va.
- * Lockport, 25 1 by telephone, Worthville.
- * Marion, 15 1 by telephone, Worthville.
- * Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
- * Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. Va.
- * Peach Orchard, 25 2 Catlettsburg.
- * Pine Grove, 50 3 Huntington, W. Va.
- * Port Riffe, 25 1 by telephone, Worthville.
- * Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
- * Roc. v. lls 25 2 Catlettsburg.
- * Springport, 20 1 by telephone, Worthville.

LOUISIANA.

| | | |
|---------------------|--------------------|----------------------|
| 404 Atchafalaya. | 395 Grosse Tete. | 438 Pradhomme. |
| 395 Baton Rouge Jr. | 354 Lookout. | 438 Robeline. |
| 424 Boyce. | 424 Leoo pte. | 442 San Patrice. |
| 424 Verbonne. | 395 Maringuin. | 433 Sinnott. |
| 424 Kona. | 434 Marmoueau. | 442 Stonewall. |
| 424 Garland. | 433 Moreland. | 395 Vacherie. |
| 472 Gloster. | 595 Plaquemine. | 395 W. B. ton Rouge. |
| 375 Gouldsboro. | 442 Pleasant mill. | 424 Whitesville. |
| 442 Grand Cane. | 433 Provençal. | |

- * Fodoché, 50 3 (30 2 N. M. rate), New Orleans.
- * Millikens Bend (N. M.) 40 3 La lula.
- * St. James, 50 3 (30 2 N. M. rate), New Orleans.

MAINE.

| | |
|--|---|
| 4 Presque Isle. | 16 Lake Maranacook Ck. Livermore Falls. |
| * La Grange, 25 2 Bangor. | |
| * Kennebuport 15 0 stage, Kennebunk. | |
| * Poland Spring, Summer Office, 20 1 Lewiston. | |
| * Ocean Bluffs 5 0 stage, Kennebunk. | |
| * Red Beach 15 1 by telephone, Calais. | |
| * Robbinston, 20 1 telephone Calais. | |
| * Sebec, 25 2 Bangor. | |
| * So. La Grange 25 2 Bangor. | |

MANITOBA.

| | | |
|----------------|------------------|------------------|
| Alexandria. | Flat Creek. | Reaburn. |
| Austin. | Gladstone. | Rosser. |
| Brandon. | McGregor. | Sewell. |
| Burnside. | Minnetosa. | St Boniface June |
| Chatter. | Neepawa. | Sidney. |
| Dewinton. | Portage La Pral- | Third siding. |
| End of Track. | rie sta. | Westbourne. |
| Fourth siding. | Rapid City. | West Lynne. |

The above named offices in Manitoba (except Portage La Prairie, Reaburn, Rosser, St. Boniface Junc. and West Lorne) should be checked direct at the rate of 25 and 2 more than the Manitoba State rate.

MARYLAND.

| | | |
|--------------------------|-----------------|--|
| 85 Ashland. | 60 Fruitland. | 54 Peninsular Junc. |
| 67 black, summer office. | 85 Lutherville. | 54 Pocomoke Station Ok. Pocomoke City. |
| 77 Bowie. | 67 Millington. | 67 Prices. |
| 67 Centerville. | 67 Octorok. | 67 Sudlersville. |
| 67 Churchville. | 67 Odenton. | |
| 67 Edgewood. | | |

* Gaithersburg, 25 2 Baltimore.
* Hyattsville, 25 2 Baltimore, Md., or Washington, D. C.
Charge for three extra words in messages to Gaithersburg and Hyattsville, and accept only prepaid day messages.

MASSACHUSETTS.

| | | |
|--|--------------------|---------------|
| 36 Conway. | 21 Wellsley Hills. | 21 Tyngsboro. |
| 23 New Salem. | 12 W. Harwich. Ok. | 25 W. Medway. |
| 25 Oxford. | | |
| Dennisport. | | |
| * Asylum Sta., 75 0 Danvers. | | |
| * Bane River Harbor, free by telephone, So. Dennis. | | |
| * Burlington 150 0 Woburn. | | |
| * Cochesett, 25 0 by telephone, East Bridgewater. | | |
| * Collins' Mills, Dracut, 15 1 by telephone, Lowell. | | |
| * Cummingsville, 50 0 Woburn. | | |
| * Danvers Centre, 25 0 Danvers. | | |
| * Danvers Inmate Hospital, free by telephone, Salem. | | |
| * Danversport, 25 0 Danvers. | | |
| * Dracut Navy Yard, 15 1 by telephone, Lowell. | | |
| * Forge Village, 15 1 by telephone, Lowell. | | |
| * Gardner, 15 0 Gardner Depot. | | |
| * Graniteville, 15 1 by telephone, Lowell. | | |
| * Hallowell, free, Braintree. | | |
| * Hyannisport, 15 0 by telephone, Hyannis. | | |
| * Longmeadow, 150 0 E. Longmeadow. | | |
| * Lunenburg, 150 0 by telephone, Fitchburg. | | |
| * Matfield, 50 0 East Bridgewater. | | |
| * Melrose Highlands, 25 0 Melrose. | | |
| * Middlesex Village, 15 1 by telephone, Lowell. | | |
| * No. Middleboro, 150 0 Middleboro. | | |
| * No. Woburn 75 0 Woburn. | | |
| * Phoenix Village, Tewksbury, 15 1 by telephone, Lowell. | | |
| * Point of Lines Revere Beach 25 0 telephone, Chelsea. | | |
| * Rock, 150 0 Middleboro. | | |
| * South Billerica, 15 1 by telephone, Lowell. | | |
| * So. Gardner, 15 0 Gardner Depot. | | |
| * South Mills, 10 0 by telephone, New Bedford. | | |
| * Weentham, 35 0 by telephone, Providence, R. I. | | |
| * West Bridgewater, 15 0 by telephone, East Bridgewater. | | |
| * W. Chelmsford, 15 1 by telephone, Lowell. | | |
| * W. Danvers, 150 0 Danvers. | | |
| * Westford, 25 0, Westford Depot. | | |
| * Westford Depot, 15 1 by telephone, Lowell. | | |
| * West Gardner, 15 0 Gardner Depot. | | |
| * Woburn Highlands, 25 0 Woburn. | | |

MEXICO.

| |
|--|
| * Gallego, 58 6 El Paso, Tex. |
| * La Jarita, 25 0 Laredo, Texas. |
| * Laguna, 66 7 El Paso, Tex. |
| * Montezuma, 52 5 El Paso, Tex. |
| * Paso del Norte, 25 2 El Paso, Tex. |
| * Parra de Hidalgo, 450 43 Brownsville, Tex. |
| * Rodriguez, 25 2 Laredo, Texas. |
| * Samalayuca, 40 4 El Paso, Tex. |
| * San Jose, 43 4 El Paso, Tex. |

MICHIGAN.

| | | |
|--|-----------------------|---------------------|
| 127 Alanson. | 210 Fostoria. | 231 North Fayette. |
| 127 Bay View. | 127 Freedom. | 231 North Morenci. |
| 138 Beaver Lake. | 119 Free Soil. | 250 Orleans. |
| 220 Beech. | 230 Gardfield. | 270 Penn. |
| 269 Bowers. | 137 Hobart. | 333 Powers (north). |
| 231 Bridge water. | 127 Indian River. | 333 Spalding. |
| 211 Britton. | 231 Jerome. | 260 Bansom. |
| 210 Brookway Centre. | 230 Kawkawlin. | 200 Sanborns. |
| 210 Brown City. | 119 Manistee Junc. | 260 Shelbyville. |
| 240 Collins. | 210 Marquette. | 220 Swartz Creek. |
| 250 Orapo. | 137 Milton Junc. | 127 Tophabee. |
| 336 Crystal Falls (north). | 210 Mayville. | 127 Vanderbilt. |
| | 260 Moline. | 269 Walkup Ok. |
| 269 Diamond Lake. | 127 Mullet Lake. | |
| Ok. White Cloud. | 333 Narenta. (North). | 100 Wetsell. |
| | | 127 Wolverine. |
| * Au Train, 40 8 Marquette. | | |
| * Flushing, 15 0 by telephone, Flint. | | |
| * Lee ville 15 0 telephone, Detroit. | | |
| * Munising, 40 8 (30 2 N. rate), Marquette. | | |
| * Newberry, 40 8 (30 2 N. M. rate) Marquette. | | |
| * Palme, 4 8 (30 2 N. M. rate) Marquette. | | |
| * Roseville 15 0 telephone, Detroit. | | |
| * St Ignace, 40 8 (30 2 N. M. rate) Marquette. | | |
| * Sand River, 40 8 Marquette. | | |
| * Seney, 40 8 (30 2 N. M. rate) Marquette. | | |

MINNESOTA.

| | | |
|---|----------------------|--------------------|
| 190 Argyle. | 883 Humboldt. | 865 Northome, Sum- |
| 885 Arlington. | 889 Kennedy. | mer Office. |
| 885 Baile Lake. | 884 Kitson. | 870 Osawa. |
| 875 Buffalo Lake. | 865 Lake Park Hotel. | 885 Parkdale. |
| 885 Clithral. | Lake Minnetonka. | 865 S. Albans. |
| 865 Cologne. | 861 Lakeland. | 892 slayton. |
| 874 Deer Creek. | 861 Minnehaha. | 860 Sturgeon Lake. |
| 880 Gardfield. | 865 Minnetonka. | 876 Vernon Centre. |
| 865 Geyord. | Beach. | 865 Waconia. |
| 870 Green Isle. | 890 Mankato. | 865 Winthrop. |
| 874 Heming. | 883 Northcote. | |
| * Currie, 25 2 Tracy. | | |
| * Deforest, 40 8 Ramsey, Minn., or 50 8 La Crosse, Wis., or 35 2 Sioux Falls, Dak. | | |
| * Prairie Junc., 40 8 Ramsey, Minn., or 50 8 La Crosse, Wis., or 35 2 Sioux Falls, Dak. | | |

MISSISSIPPI.

| | |
|---------------------------------|-------------|
| 363 Armistead. | 363 Morton. |
| * Arcola, 85 6 Vicksburg. | |
| * Johnsonville, 85 6 Vicksburg. | |
| * Overley, 85 6 Vicksburg. | |

* Shipland 50 8 Vicksburg.
* Stoneville, 85 6 Vicksburg.

MISSOURI.

| | | |
|--|-------------------------|----------------------|
| 399 Aurora. | Miller 360 Grays Ridge. | 359 Montecano Spgs. |
| 446 Calla. | 388 Granger. | 422 Montecarlo. |
| 398 Clark. | 370 Hogan. | 437 Napoleon. |
| 369 Creve Coeur Lake. | 388 Knox. | 369 Richfield, Ok. |
| 467 Ellis. | La Cede, St. Louis. | Old Monroe. |
| 369 Eliah. | 487 Lake City. | 399 Russellville. |
| 418 Fountain Grove. | 349 Lakeville. | 437 Samsel. |
| 370 Gads Hill. | 398 McMullin. | 398 Shelbyville. Ok. |
| 427 Gault. | 370 Middlebrook. | 359 Vinland. |
| 369 Gilmore. | | |
| * Ashley, 10 0, by telephone, Bowling Green. | | |
| * Augusta, By mail, Labadie. | | |
| * Greenfield, 50 0 So. Greenfield. | | |
| * Lemons 25 2, Unionville. | | |
| * Purdin, 25 2 Unionville. | | |

MONTANA.

| | | |
|--|--------------|----------------------|
| 957 Ainslie. | 956 Keith. | 957 Milton. |
| 957 Big Horn. | 958 Martin. | 950 Pompey Pillar. |
| 970 Cabinet. | 959 Myers. | 533 Silver Bow Junc. |
| 958 Forsythe. | 533 Malross. | 957 Terry. |
| 960 Huntley. | | |
| * Billings, 25 1 Helena, Mon. or 50 2 Bismarck, Dak. | | |
| * Ft. Maginnies 50 2 Bismarck, Dakota. | | |
| * Rocky Point 25 1 Bismarck, Dakota. | | |
| * Mardenville, mail Ft. Maginnies. | | |
| * Walkerville, 80 2 telephone Butte City. | | |

NEBRASKA.

| | | |
|--|------------------|--------------------|
| 474 Adams. | 464 Gilmore. | 465 Stella. |
| 927 Alnoworth. | 464 House. | 474 Talmage. |
| 977 Atkinson. | 474 Howe. | 927 Stuart. |
| 474 Avoca. | 927 Inman. | 465 Verdon. |
| 474 Brook. | 22 Long Pine. | 478 Wakefield. |
| 538 Chappell. | 974 Sheridan. | 478 Wayne. |
| 922 Clear Water. | 464 Springfield. | 474 Weeping Water. |
| * Auburn (N. M.), 25 2 Nemaha City. | | |
| * Benktown, (N. M.), 60 4 Plattsmouth. | | |
| * Burchard, (N. M.), 35 2 Plattsmouth. | | |
| * Haigler, (N. M.), 60 4 Plattsmouth. | | |
| * Liberty, (N. M.), 35 2 Plattsmouth. | | |
| * McCook (N. M.) 55 4 Plattsmouth. | | |
| * Putnam (N. M.) 35 2 Plattsmouth. | | |
| * Stratton, (N. M.), 55 4 Plattsmouth. | | |

NEVADA.

| | | |
|---------------|-------------|-------------------|
| 677 Junction. | 677 Rhodes. | 676 Soda Springs. |
| 676 Luning. | | |

NEW BRUNSWICK.

| | | |
|--------------------------------|---------------|--------------|
| * Albart. | * Lake Ha Ha. | * St. Louis. |
| * Carleton Sta. | | |
| * Port Elgin, 25 2, Backville. | | |

NEW HAMPSHIRE.

| | | |
|--|----------------|---------------|
| 20 Intervale, summer office. | 31 E. Lebanon. | 20 Livermore. |
| * Chesterfield, 25 0 by telephone, Brattleboro, Vt. | | |
| * Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt. | | |
| * Concord State Prison, 10 0 by telephone, Concord. | | |
| * North Hinsdale, 20 0 by telephone, Brattleboro, Vt. | | |
| * W. Concord, 15 1 telephone, Concord. | | |

NEW JERSEY.

| | | |
|--|----------------------------|----------------------------------|
| 47 Bay Head. | 41 Franklin (Essex Mills). | 53 Malaga, Summer office. |
| 53 Blaintown. | 47 Forked River Sta. | 52 Nolaas Point, Lake Hopatcong. |
| 41 Brick Church. | 53 Franklinville. | 41 Oradell. |
| Tariff same as Orange. | Summer office 41 Oradell. | |
| 53 Cedar Brook. | 47 Hartford. | 52 Valley. |
| 47 Centerville, Passaic Co. | 41 H. writta. | 47 Waretown. |
| 47 Chadwick. | 41 Iselin. | 41 Wayne. |
| 47 Cimenton. | 47 Kingston. | Ok. 41 West Orange. |
| 52 Funderline, Ok. | 47 Magnolia. | 52 Vienna. |
| Somerville. | | |
| * Barnegat City 25 1 Philadelphia, Pa. | | |
| * Crosswicks 15 1 telephone, Trenton. | | |
| * Yardville 15 1 telephone, Trenton. | | |

NEW MEXICO.

| | | |
|-----------------------------------|------------------|-------------------|
| 559 Blossburg. | 538 Gage. | 632 Monero. |
| 556 Oerrillos. | 537 Gallup. | 630 San Antonio. |
| 537 Coolidge. | 560 Hot Springs. | 638 Separ. |
| 559 Dillon. | 633 Lava. | 639 Stein's Pass. |
| 633 Flo ida. | 626 La Joya. | 636 Upham. |
| 828 Fort Selden, Ok. | 559 Lynn, Ok. | |
| Las Cruces. | Morley, Col. | |
| * Fort Stanton, 25 3 San Marcial. | | |
| * Fort Union, 25 2, Watrous. | | |
| * Ojo Caliente, 50 0 Barranca. | | |

NEW YORK.

| | | |
|------------------------------|---------------------|--------------------------|
| 64 Albion Station. | same as Wat- | 73 Round Island. |
| Cawego Co. Ok. | kina, Ok. Wat- | Park, St. Law- |
| and Bank. | kina. | rence River. |
| 65 Apalachin. | 101 Halbert. | 74 Scriba. |
| 33 Broad Channel. | 41 Hartsdale. | 40 So. Cairo. |
| Rockaway Beach. | 40 Hensenville. | 46 State Camp. |
| Summer-office, Ok. B. Beach. | 58 Jeffersonville. | Peekakill. |
| 33 Brown's Sta. Yates. | 101 Lakeville, Sum- | 46 Sterlington. |
| mer Office. | mer Office. | 37 Stormville. |
| 111 Ceres. | 111 Little Genesee. | 41 Tarrytown Sta. |
| 139 Oh'auqua, Sum- | 46 Livingston Man- | 73 Thousand Island. |
| mer Office. | or. | Park, Summer office. |
| 101 Cohocton. | 33 Lowmanville. | 44 Trembloys Iron Works. |
| 46 Cor. wall on Hud- | 64 Manusville. | |
| son. | 74 McDonnellsville. | 65 Vestal. |
| 33 E. Rockaway sum- | 44 Millers ranase. | 46 Wallkill. |
| mer office. | Lake House. | 111 Westons, Catta- |
| 74 Fish Creek. | 46 Milton. | raugus Co. |
| 51 F. h's kddy, Del- | 33 Nichols. | 87 West ratterson. |
| aware Co. | 41 North Tarryto'n. | 74 West Vienna. |
| 33 Great Neck, L. I. | 33 North Lansing. | 111 White House. |
| 33 Greenmount. | 61 Rockland. | 46 Wicopee Junc. |
| 33 Glen Mountain | 33 Ronkonkoma. | 111 Wigwam. |
| House, Tariff | | |

* Allens Hill, 20 0 telephone, Canandaigua.
* Ava, 20 0 telephone, Rome.
* Bath-on-the-Hudson, 25 0 Albany.
* Bistol, 15 0 telephone, Canandaigua.
* Brushland, 25 2, Delhi.
* Delta, 10 0 telephone, Rome.
* Four Corners S. I., 30 0 W. New Brighton.
* Ghent 15 1 telephone, Chatham.
* Honeyoe, 25 0 telephone, Canandaigua.
* Ke. wood, 25 0 Albany.
* Lee Centre, 10 0 telephone, Rome.
* Lincolnville, S. I., 100 0 W. New Brighton.
* Minisink, Orange Co., 15 1 Port Jervis.
* Point Rock, 15 0 telephone, Rome.
* Stokes, 10 0 telephone, Rome.
* Taberg, 15 0 telephone, Rome.
* Vernon, 10 0 by telephone, Oneida.
* W. Branch, 15 0 telephone, Rome.
* Whitestown, 75 0 U.ica.

NORTH CAROLINA.

| | | |
|--|------------------|-------------------|
| 205 Alexanders. | 124 Jamestown. | 194 Warm Springs. |
| 115 Chapel Hill. | 178 Newton. | 98 Whiteville. |
| 125 Laurel Hill. | 144 Rowan Mills. | |
| * Falkland, 25 2 (25 1 N. M. rate), Tarboro. | | |
| * Nags Head 25 1 Norfolk, Va. | | |
| * Pactolus, 40 8 (30 2 N. M. rate), Tarboro. | | |

NOVA SCOTIA.

| | | |
|---|---------------|----------------|
| 2 Albion Mines. | 2 Sherbrooke. | 2 White Haven. |
| * Baddeck, 25 2 North Sydney. | | |
| * Ingonish, 25 2 North Sydney. | | |
| * Tusket, 15 1 telephone, Yarmouth. | | |
| * Tusket Lodge, 15 1 telephone, Yarmouth. | | |

OHIO.

| | | |
|--|----------------------|---------------------|
| 221 Alvada. | 202 Hadley Junction. | 222 New Carlisle. |
| 231 Alvordston. | 243 Hollandsburg. | 213 Newport. |
| 170 Barton. | 170 Jewett. | 159 North Benton. |
| 151 Brilliant. | 191 Lakeville. | 142 Osgood Sta. |
| 223 Brown. | 242 Laura. | 192 Point Pleasant. |
| 218 Buena Vista. | 180 Lodi. | Gallia Co. |
| 201 Clarksfield. | 202 Longstreth. | 252 St. Johna. |
| 180 Oreston. | 221 Luckey. | 180 Spencer, Medina |
| 180 Dalton. | 242 Ludlow Falls. | Co. |
| 232 Enterprise. | 221 McComb. | 212 Storms. |
| 180 Everett, Summit. | 221 McClure. | 213 Wheelersburg. |
| Co. | 232 Mercer. | 180 West View. |
| 180 Fair Grounds. | 222 Mill-dgeville. | 232 Westville. |
| 222 Freeport, Warren. | 180 Berlin, Stark. | 232 Yorkshire. |
| Co. | Co. | |
| 180 Geauga Lake. | | |
| * Anderson station, 10 0 by telephone, Chillicothe. | | |
| * Andersonville, 10 0 by telephone, Chillicothe. | | |
| * Biers Run, 10 0 by telephone, Chillicothe. | | |
| * Brownstown, 10 0 by telephone, Chillicothe. | | |
| * Catawba Island, Ottawa Co. 25 2 Sandusky. | | |
| * Clarksburgh, 10 0 by telephone, Chillicothe. | | |
| * Darbyville, 10 0 by telephone, Circleville. | | |
| * De Kalb, 25 2 Mansfield. | | |
| * East Orwell, (N. M.) 25 2 Ashtabula. | | |
| * Five Points 10 0 by telephone, Circleville. | | |
| * Greenland, 10 0 by telephone, Chillicothe. | | |
| * Hayaville, Pickaway Co., 10 0 by telephone, Circleville. | | |
| * Hartsville, 15 1 Minerva. | | |
| * Hayaville, Ashland Co., 15 1 by telephone, Ashland. | | |
| * Jeromeville, 15 1 by telephone, Ashland. | | |
| * Kinnickinnick, 10 0 by telephone, Chillicothe. | | |
| * Middle Branch, 15 1 Minerva. | | |
| * Mogadore, 15 1 Minerva. | | |
| * Monitor 25 2 telephone, Ironton. | | |
| * Monroe Centre, 20 2 No. Kingsville. | | |
| * New Hazelton, 15 1 Minerva. | | |
| * New Highland 25 2 telephone, Ironton. | | |
| * No. Baltimore, 25 2 Deane or Tiffin. | | |
| * O. kwood, 25 2 Fostoria, O., or Ft. Wayne, Ind. | | |
| * Osnaburg, 15 1 Minerva. | | |
| * Pierpont, 25 2 No. Kingsville. | | |
| * Poland, free by telephone, Youngstown. | | |
| * Racine 20 1 telephone, Pomeroy. | | |
| * Red Lion, 15 1 by telephone, Franklin. | | |
| * Rimer 25 2 Delphos. | | |
| * Robertsaville, 15 1 Minerva. | | |
| * Rutland 20 1 telephone, Pomeroy. | | |
| * Sherrudeville, 15 1 Minerva. | | |
| * So. Elmwood, 10 0 by telephone, Circleville. | | |
| * Syracuse 20 1 telephone, Pomeroy. | | |
| * Texas Hollow 25 2 telephone, Ironton. | | |
| * Venusville Sta. 25 2 telephone, Ironton. | | |
| * Yellow Mud, 10 0 by telephone, Chillicothe. | | |

OREGON.

| | |
|--|----------------|
| 785 Bonneville. | 803 Hillsboro. |
| 804 Goshen. | 795 Whites. |
| * Airie (N. M.) 50 8 Portland. | |
| * Blue Mountain, 50 5 by telephone, Walla Walla, W. T. | |
| * Fort Klamath, 50 3 Ashland. | |

PENNSYLVANIA.

| | | |
|------------------------|---|-----------------------|
| 84 Antes Fort. | 94 Hunter's Run. | Slippery Rock. |
| 59 Ardmore. | 140 Jackson Centre. | 84 Snydertown. |
| 140 Arthurs. | 93 Jackson Summit. | 111 Songbird. |
| 140 Bald Ridge. | 181 June Bug. | 140 S. & A. Junction. |
| 140 Berwyn. | 93 Landrus. | (K. Mercer). |
| 59 Brandywine Summit. | 76 Leaman Place. | 151 South Side Pitt. |
| 130 Clarendon Depot. | 59 Lewistown Junc. | Burg. Tariff |
| Tariff same as Warren. | 59 Logan, Phila. Co. | same as Pitts- |
| | Ok. Wayne Junc. | burgh. Ok. |
| | 140 Lucinda Station. | Pittsburgh. |
| 140 Coal-town. | 59 Lukens, Ok. Nor-131 Stonerville. | |
| 66 Conyngham. | 140 Manti. | 140 Strattonville. |
| 140 Coats. | 180 Marienville. | 130 Thompsons, War- |
| 52 Cresco, Monroe Co. | 84 Mainville. | ren Co. |
| | 93 Morris, Tioga | 130 Tiona. |
| 58 Dunmore, Ok. | Co. | 66 Tripoli, Ok. |
| Scranton. | 84 Mountain Grove. | Kempton. |
| 59 East Greenville. | 140 Neeshannock Falls. | 111 Turle Point. |
| 122 Elk Lick. | 59 Rahn's, Ok. Col-150 Union City Depot | |
| 151 Ena, Allegheny Co. | 66 Plymouth Junc. | 59 Virginville, Ok. |
| 140 Evansburg, But- | Ok. Plymouth, | Moslem. |

151 Fallston. 140 Rimersburg. 140 Volant.
121 Fairmount City. 76 Richard, Ok. 150 Waterford Depot.
130 Farnsworth. 111 Schanda. 130 Warren Depot.
130 Garfield. 58 Rowland's. 59 Wayne, Delaware
59 Geigertown. 94 St. Thomas. 84 W. Milton Ok.
84 Georgetown. 111 Schanda. 151 Montgomery.
59 Gibraltar, Ok. 59 Shelly Tariff. 151 Wildwood.
Bl. daboro same as Qua-151 Wilkinsburg.
66 Girard Manor. Kertown, Ok. 75 Willowanna.
Ok. Ringtown. Quakertown. 151 Willow Grove,
59 Glen Moore. 180 Shenfeld Depot. Allegheny Co.
59 Honey Brook. 47 Schenck, Ok. 140 Wilmington.
66 Hunlock's. Bristol. 140 Zellenople.

* Academy Corners, 10 1 by telephone, Lawrenceville.
* Alma House, 10 1 Allentown.
* Ballietville, 10 1 Allentown.
* Best sta, 10 1 Allentown.
* Centre Point, 10 1 Allentown.
* Centerville, Elk Co., free, by telephone, Seahonda.
* Churchoville Berks Co., 10 1 Allentown.
* Clayton, 10 1 Allentown.
* Corning, 10 1 Allentown.
* Cowanesque Valley, 20 1 by telephone, Lawrenceville.
* Dillingersville, 10 1 Allentown.
* Elmer, 20 1 by telephone, Lawrenceville.
* Eagleville, 10 1 Allentown.
* Fairview, Montgomery Co., 10 1 Allentown.
* Fagleyville, 10 1 Allentown.
* Franklin, Lehigh Co. 10 1 Allentown.
* Glibertville, 10 1 Allentown.
* Harrison Valley, 20 1 by telephone, Lawrenceville.
* Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.

* Ironton, 10 1 Allentown.
* Limerick Square, 10 1 Allentown.
* Lower Milford, 10 1 Allentown.
* Neffs, 10 1 Allentown.
* Nelson, 10 1 by telephone, Lawrenceville.
* New Berlin, 10 1 Allentown.
* Overbrook, free by telephone, Merion Sta., Mont'y Co.
* Pleasant Corner, 10 1 Allentown.
* Red Hill, 10 1 Allentown.
* Bachsville, 10 1 Allentown.
* Sagersville, 10 1 Allentown.
* Schnecksville, 10 1 Allentown.
* Slatedale, 10 1 Allentown.
* Trappe, 10 1 Allentown.
* Unionville, Chester Co., 100 0 Kennett Square.
* * Wurtzburg, 25 0 Slippery Rock.
* Yellow House, 10 1 Allentown.
* Zionsville Sta., 10 1 Allentown.

PRINCE EDWARD ISLAND.

* Bear River, 50 3 Sackville, N. B.
* Bedford, 50 3 Sackville, N. B.
* Bloomfield, 50 3 Sackville, N. B.
* Breada bonn, 50 3 Sackville, N. B.
* County Line, 50 3 Sackville, N. B.
* Freetown, 50 3 Sackville, N. B.
* Monell, 50 3 Sackville, N. B.
* O'Leary, 50 3 Sackville, N. B.
* Port Hill sta., 50 3 Sackville, N. B.
* Wellington, 50 3 Sackville, N. B.
* York, 50 3 Sackville, N. B.

QUEBEC.

Beauce June. St. Alphonse de la Grande
Bulwer. Bale.
Eustis.

* Amherst Harbor, Magdalen Islands, 75 5 No. Sydney, N.S.
* Etang du Nord, Magdalen Islands, 75 5 No. Sydney, N.S.
* Grosse Isle, Magdalen Islands, 75 5 North Sydney, N.S.
* House Harbor, Magdalen Islands, 75 5 No. Sydney, N.S.

RHODE ISLAND.

18 Riverside.
* Barrington, 25 0 by telephone, Providence.
* Chepachet, 25 0 by telephone, Providence.
* Hamilton, 25 0 by telephone, Providence.
* Wrentham, 25 0 by telephone, Providence.

SOUTH CAROLINA.

163 Black's. 146 Ravens. 174 Welford.
146 Jacksonboro. 165 Ridgeland.

TENNESSEE.

292 Bellevue. 292 Madison. 292 White Bluff.
292 Bon Aqua Sp'gs. 292 Sunbright. 215 Whitesburg.
245 Coulterville. 183 Union Depot. 340 Witha.
245 Lansing. 292 Warner.

* Knea Springs, Summer office, 25 2 Spring City.
* Somerville. 25 2 Moscow.
* Obion, 25 2, River.

TEXAS.

500 Abbott. 510 Farmersville. 390 San Elizario (So.)
552 Albany. 490 Forest. 657 Sherman (So.)
550 Aledo. 673 Haskell, (South). 655 San Martin (So.)
551 Alexander. 648 Hodge. 674 Strowd's, (So.)
516 Antelope (South). 489 Hungerford. 608 Temple June.
559 Atascosa (South). 654 Latah (South). 490 Thoradale.
479 Bagwells. 603 Lorena. 608 Troy.
557 Boracho (South). 470 Lodi. 670 Twibig (So.)
570 Catulla (South). 655 Mets (South). 557 Van Horn, (South)
557 Carlos Pass (So). 673 Marks (South). 470 Wayne.
470 Carrolls Prairie. 603 Mountain Home 671 Webb (South).
485 Clear Creek. Bell Co. 500 West.
495 Cuero (South). 659 Odessa (South). 557 Wildhorse (South)
499 Davenport (So). 655 Pearmi (South). 483 Winona.
494 Dupree. 655 Pyote (South). 489 Wharton
570 Encinal (South). 652 Putnam. 830 Yaleta (So)
503 Eddy. 655 Sand Hills, (So).

* Aguilares, 50 3 Corpus Christi, or 30 2 Laredo.
* Anora, 25 2 Ft. Worth.
* Benavides, 40 3 Corpus Christi, or Laredo.
* Bowie, 30 2 Fort Worth.
* D'harris, 50 3 San Antonio.
* Eagle Pass Junction, 100 7 San Antonio.
* Henrietta, 25 1 Denison, Texas, or Dodge City, Ka. or 35 3 Ft. Worth.

* Hondo City, 50 3 San Antonio.
* Kaufman, mail, Dallas.
* Kounts, 35 2 Beaumont.
* Lacoste, 40 3 San Antonio.
* Los Angeles, 50 3 Corpus Christi, or 30 2 Laredo
* Pena, 40 3 Corpus Christi, or Laredo.
* Realitos, 40 3 Corpus Christi.
* Sabinal, 7 5 San Antonio.
* Salado, 40 3 Austin.
* San Diego, 40 3 Corpus Christi, or 50 3 Laredo.
* Sunset 30 2 Ft. Worth.
* Village, 40 3 Beaumont.

UTAH.

575 Hot Springs.
* No Ogden 30 2 by telephone, Ogden.
* Plain City, 50 3 by telephone, Ogden.

VERMONT.

88 Congress Hall Sheldon. 77 Passumpsic.
Summer office. 31 Pompanoosne.
38 Main Bay. 39 South Wallingford.
41 Miles Pond. Ok. St.
Johnsbury.

* East Arlington, 10 1 Arlington.
* E. Rupert, 15 2 Factory Point.
* Guilford, 10 0 by telephone, Brattleboro.
* Hartwellville, 20 1 by telephone, No. Adams, Mass.
* Jacksonville, 25 2 by telephone, No. Adams, Mass.
* North Stamford, 15 1 by telephone, No. Adams, Mass.
* Needaboro, 20 1 by telephone, No. Adams, Mass.
* Needaboro Falls, 20 1 by telephone, No. Adams, Mass.
* Needawga, 25 2 by telephone, No. Adams, Mass.
* Stamford, 15 1 by telephone, No. Adams, Mass.
* Wells, 15 2 Factory Point.
* West Arlington, 15 1 Arlington.
* West Dover, 25 0 by telephone, Brattleboro.
* Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

123 Afton. 114 Concord. 86 E. F. & P. June.
114 Appomattox. 123 Greenville. 1 3 Riverside.
163 Bacabone. 123 Lynchurst. 163 Boanoke.
96 Bon Air, Chester-123 Miles. 163 Troutville.
field Co. 123 New River Depot. 123 Va. avus.
133 Bufords. 133 Lithia. 113 White Post.
163 Clifton Forge. 96 Bottoway C. H. 96 Wilson's Depot
153 Cloverdale. 96 Plains.
* Henrico, 25 2 Richmond.
* Indian Rock (N. M.), 40 3 Richmond.
* Lairds, (N. M.), 40 3 Richmond.
* Lee Hall, 30 2 Richmond.
* New Market, Nelson Co., (N. M.) 25 2 Richmond.
* Salisbury, (N. M.), 40 3 Richmond.
* Wilton (N. M.), 50 3 Richmond.
* Yorktown, 45 3 Richmond.

WASHINGTON TERRITORY.

784 Carbonado. 727 Prescott. 723 So Texas.
978 Marshall. 774 Skagit City. 738 Tushet.

WEST VIRGINIA.

* Janelew, 1 50 4 Wheeling or Parkersburg.
* Lost Creek, 1 50 4 Wheeling or Parkersburg.
* Talcott, (N. M.) 25 2 Greenbrier, W. S. Spgs. or 50 3 Huntington.
* Weston, 1 50 4 Wheeling or Parkersburg.
* Winifrede June, (N. M.) 30 2 Greenbrier, W. S. Spgs. or 45 3 Huntington.

† Charge for three extra words in messages to these offices; and accept only prepaid day messages.

WISCONSIN.

887 Abrams. 356 Livingston. 345 Sauk City.
550 Barneveld. 325 London. 306 Spring Meadow.
306 Calhoun. 325 Marshall. 337 Stillis.
325 Cottage Grove. 342 Meehan. 326 Sullivan.
347 Curtiss. 345 Merritts Land'g 354 Superior.
306 Doumenan. 306 No. Greenfield. 352 Superior June.
340 Eden, Fond du Lac. 359 Leelanau Sta. 359 Summit Lake.
Lac. Co. 345 Prairie du Sac. 345 Twin Bluffs.
339 Elmh. ret. 345 Highland City. 350 Tunnel City.
352 Hayward. Ok. Lone Rock. 355 Turtle Lake.
326 Jefferson June. 347 Rudolph. 306 Wales.
439 Kampeter.

* Bailey's Harbor 25 2 Horn's Pier.
* Big Suamico, 15 0 by telephone Green Bay.
* Cary, 25 2 Eau Claire.
* Downsville, 25 2 Eau Claire.
* Dunville, 25 2 Eau Claire.
* Durand, 25 2 Eau Claire.
* Jacksonport, 25 2 Horn's pier.
* Lawrence, 25 2 Eau Claire.
* Meridean, 25 2 Eau Claire.
* Porterville, 25 2 Eau Claire.
* Shawtown, 25 2 Eau Claire.
* Sturgeon Bay Canal, 25 2 Horns Pier.
* St. Josephs Pier. 25 2 Horns Pier.
* Whitefish Bay, Door Co., 25 2 Horn's Pier.

WYOMING.

Cokeville. 551 Harper.

NORVIN GREEN,

President.

TRANSFER SERVICE.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY,
New York, August 15, 1882.

To all Transfer Agents:

MR. J. B. TREE has been appointed Acting Transfer Agent of this Company at Richmond, Va.

NORVIN GREEN,
President.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

DISCHARGE OF ELECTRICITY BY HEATED BODIES.

It is stated, in *Engineering*, that a burning match or a gas flame acts as a discharge of electricity, this fact having been applied by Sir William Thomson to his portable electrometer in observing the potential of the atmosphere at any point. Recent experiments by Professor Guthrie have shown that an incandescent platinum wire also acts as a discharge of electricity, displaying a preference for discharging a negative rather than a positive charge. If a platinum wire, made incandescent by an electric current, is placed between two gold-leaf electrosopes, one charged with positive and the other with negative electricity, it will be found that the negative charge is rapidly drawn off, while the positive charge remains almost unaffected. The wire in this experiment was at a dull red heat, and it is probable that a higher temperature would also have effected the discharge of the positive electricity. Professor Guthrie likewise shows that a red-hot metal ball at certain high temperatures will not accept a charge of positive or negative electricity from the conductors of a glass electrical machine, while at certain lower temperature it will accept a negative charge, but not a positive one, and at still lower temperature it will take both a positive and negative charge.

THERE is an impression abroad among electricians, both of the theoretical and the practical side of the house, that in the near future there is much more to be gained in turning to the best account past discoveries than in trying to make new ones. This is what *L'Electricite* has begun to say of those who would be their own biographers and take very good care not to underrate themselves: "Bell does not efface Reis; Faure cannot destroy Plante, and Swan, Edison, and the others cannot suppress the anterior labors of Chanzy."

EXPERIMENTS have been made with the electric lamp for locomotives on the system of Messrs. Sed. laczel and Wikulil, on the North France Railway. The lamp is placed in front of the engine, so as to light the permanent way. The experiments have shown that it burns steadily, even when the train goes at express speed; that the light does not interfere with the visibility or the distinctive color of the signals, and that neither the engine drivers nor officials of the train carrying the light, nor of other approaching trains, are dazzled by it. The drivers are able to see the line distinctly for a distance of 300 yards ahead.

It is proposed to try a novel experiment at Paris by producing a series of scientific dramas at one of the theatres, with the object of combining amusement with instruction. Three plays have already been provided, and their titles clearly indicate the direction in which the audience is to be instructed. The titles are: "Denis Pepin, or the Invention of Steam;" "Kepler, or Astronomy and the Astrologer," and "Gutenberg, or the Invention of Printing." The result of this new dramatic venture will be awaited with interest. Its success may be the inauguration of a new era in science teaching.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

(Continued from page 161.)

If, on the other hand, we have in the circuit a gaseous column, with the resistance r , we have

$$\frac{di}{dt} = nE - nR - nr i,$$

whence

$$i = \frac{E - R}{r}$$

The resistance r of the gaseous column is therefore in the numerator and not in the denominator, where it would stand according to Ohm's law. Hence we see that E must necessarily be greater than r if a current is to arise at all.

If in the case where the gaseous column is present in the circuit we introduce two different rheostatic resistances, we shall obtain, since i and i_1 denote the corresponding strengths of current,

$$i = \frac{E - R}{r} \text{ and } i_1 = \frac{E - R}{r_1}$$

If the gaseous column is thrown out of the circuit, and if M and M_1 are the resistances required to obtain again the strengths of current i and i_1 , we have

$$i = \frac{E}{M} \text{ and } i_1 = \frac{E}{M_1}$$

whence

$$\frac{i_1}{i} = \frac{M - r}{M_1 - r_1}$$

If we then assume, with Becquerel and Hittorf, that $M - r$ and $M_1 - r_1$ represent the resistances of the gaseous column at the respective strengths of current i and i_1 , we have the singular result that these resistances are inversely as the strengths of the current, though in reality they are independent of it.

ONE WAY TO PREVENT DECAY OF WOOD POSTS.

THE decay of wood embedded in the earth is difficult to guard against, but, according to the British Farmers' Gazette, a simple precaution, costing neither money nor labor, will increase the durability of posts put in the ground by 50 per cent. This is simply by taking care that the wood is inverted, i. e., placed in the opposite direction to that in which it grew. Experiments have proved that oak posts put in the ground in the same position in which they grew, top upward, were rotten in twelve years, while their neighbors, cut from the same tree and placed top downwards in the soil, showed no signs of decay for several years afterward. The theory is that the capillary tubes in the tree are so adjusted as to oppose the rising moisture when the wood is inverted.

A NEW use for the micro-telephone has been devised by Count Hugo Von Eugenberg, at Castle Tratzberg, in the Tyrol, namely, for finding underground watercourses. At several different places on the declivity of a hill, he buries a number of micro-phones in the soil, and connects each of them with a battery and a separate telephone. In the night, when other sources of disturbances are wanting, or less noticeable, he listens at the telephones, and is enabled to detect in this manner the faintest murmur or gurgling of water within the earth to a considerable depth. The microphone plays the part of the sensitive ear of hunter or savage, who is often able to detect the presence in the same way.

MAGNETIC BRICKS.

It was lately observed by Herr Kepner, at Salzburg, in the Tyrol, that some old bricks had an attractive or repellent force on a compass. From each of eight varieties of clay in the neighborhood two bricks were moulded, and one of the two in each case was baked. The unbaked bricks had no action on a magnetic needle, but seven of the eight baked bricks proved polarly magnetic. Some further experiments have been made by Herren Kell and Trientl. Particles of powder of the magnetic bricks adhered to a steel magnet. Breunerite, mica-slate, argillaceous iron-garnet, chlorite, and hornblende were, before heating, unmagnetic, but intense heating produced a magnetic polarity, the axis of which seemed to be perpendicular to the plane of stratification.

THE SECRESY OF TELEGRAMS.

IN reply to Mr. Paleston, who asked the Postmaster-General whether he had now considered the question of destroying telegrams and the insurance by that means of the same freedom and secrecy for telegrams as for communications by letter, Mr. Fawcett stated in the House of Commons last Thursday week that the practice of the Post Office had hitherto been to refuse to produce telegrams in court except upon a request by the sender or receiver, or upon the order of the judge. Some doubt having been expressed as to the legality of the course followed by the Department, he proposed to insert a clause in a Post Office Bill about to be introduced which would bring telegrams under similar provisions as to secrecy as were now applicable to letters.

AN arrangement of the bichromate of potash battery has been introduced by Mr. F. Higgins, of London. The cell consists of an earthenware jar fitted with an overflow spout near the mouth, and on the bottom is placed scrap zinc in a pool of mercury. A copper wire insulated with gutta-percha, except at the foot, where it enters the amalgam of zinc and mercury, passes down the middle of the jar. Two carbon plates arranged parallel to each other are suspended from the mouth of the cell by a frame and connected by an electrode. The battery of these cells is built up by placing each one a little below the one before it on a step, platform, or stair, so that the overflow liquor of one cell may run into the next, and thus a continual circulation of waste liquor may be going on from the high reservoir to the low one. The circulation prevents polarization of the plates and produces a powerful and steady current. The electromotive force of each cell is from 1.9 to 2 volts, and its internal resistance is a mere fraction of an ohm.

THE BROOKS PATENT INSULATORS

WERE AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1867.

At the Vienna Exposition, 1873.

At the Cincinnati Industrial Exposition in 1874.

And at the Centennial Exposition at Philadelphia in 1876.

MANUFACTURED AND FOR SALE BY

DAVID BROOKS,

22 South 21st Street, Philadelphia.

The Military Telegraph DURING OUR CIVIL WAR.

By WILLIAM B. PLUM, LL. B.

2 vols. Portraits and Illustrations. Price \$5.00

The object of this work is to show the valuable services rendered by the Military Telegraph in the late Civil War. In order to illustrate the importance of the Telegraph, and give it due setting, it was considered necessary to give a running account of the struggle itself. In this the author has been greatly aided by important telegrams and other papers, official and otherwise, which have never been published, and by many southern operators who have furnished interesting and important facts from their point of view.—*Author*

Mr. Plum's book is comprehensive, and admirably sums up the work of a very important adjunct of our armies in the field during the Rebellion. The work of the United States Military Telegraph Corps was of great importance to the Government, and the author had ample warrant for collecting all attainable facts and figures in regard to its organization and services, and in presenting them to the public as a part of the history of the late Civil War.—*Chicago Tribune*.

It is surprisingly full, and will be received by the public as well as the craft with hearty satisfaction. . . . The leading campaigns are dealt with separately, and many telegrams of commanding Generals quoted in full. The work will be invaluable to the coming historian. . . . We congratulate Mr. Plum on the ability and thoroughness of his valuable addition to history.—*The Cincinnati Commercial*.

It is in two handsome volumes, and a work of great interest, showing how in very many instances the fate of the armies and nation depended almost entirely on its corps of managers and operators.—*Gallipolis (O.) Bulletin*.

In addition to giving a history of the military telegraph during the war, it has an exposition of the ancient and modern means of communication in war and a running account of the war between the States, of the use of the telegraph, it treats of its initial State and early operations; its growth and service in the several departments, and gives many interesting incidents and biographical sketches.

The style is excellent, and there is nothing tedious in it from the beginning of the first volume to the end of the second, while it imparts great information upon a subject that is comparatively but little known.—*Canton (O.) Daily Repository*.

Address,

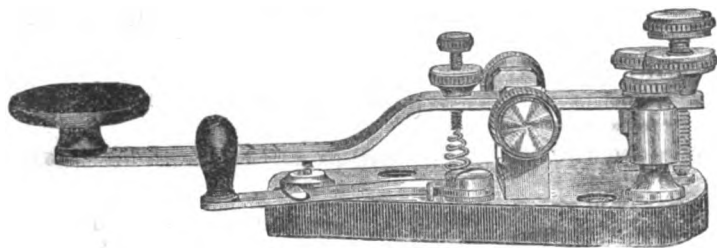
W. R. PLUM,

18 MARINE BUILDING.

CHICAGO, ILL.

PARTRICK & CARTER'S SPECIALTIES.

PERFECTION · AT LAST!



The "Acme Steel Lever Key"

Price, by mail to any part of the United States or Canada, **\$3.00**

This Key has a hard rubber base, with top connections, and is entirely nickel plated, and has received the endorsement of hundreds of operators as being the **perfection of all Keys.**

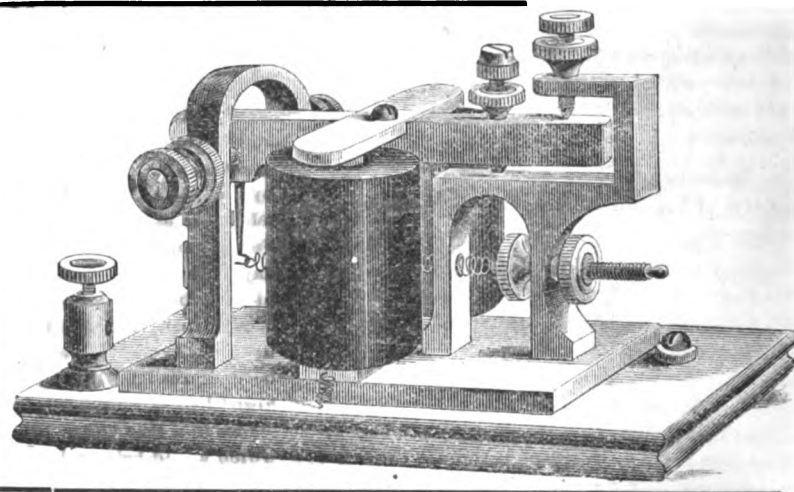
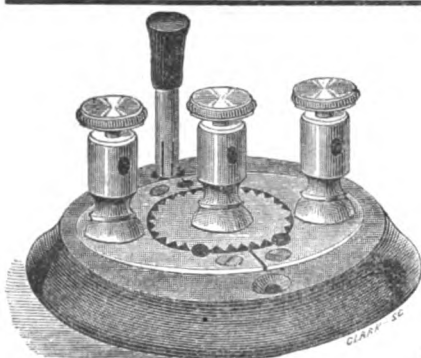
We have always been foremost in the production of "TELEGRAPHIC SPECIALTIES" and challenge the world in our line of manufactures to surpass our goods for cheapness, durability, finish and general workmanship.

We offer in addition to this splendid Key, our other specialties, as follows:

The New Giant Sounder Perfected.

Price, \$5.00, by mail.

Patented February 16, 1875, and the only patent ever granted embodying the principles contained in the "GIANT SOUNDER," and which is absolutely owned and controlled by us.



The Champion Lightning Arrester and Cut-Out.

Price, \$1.25, by mail.

This Lightning Arrester, Cut-Out and Ground-Switch combined, of which we are the originators, has been extensively copied and imitated *but never equalled*.

PremiumLearners'Apparatus

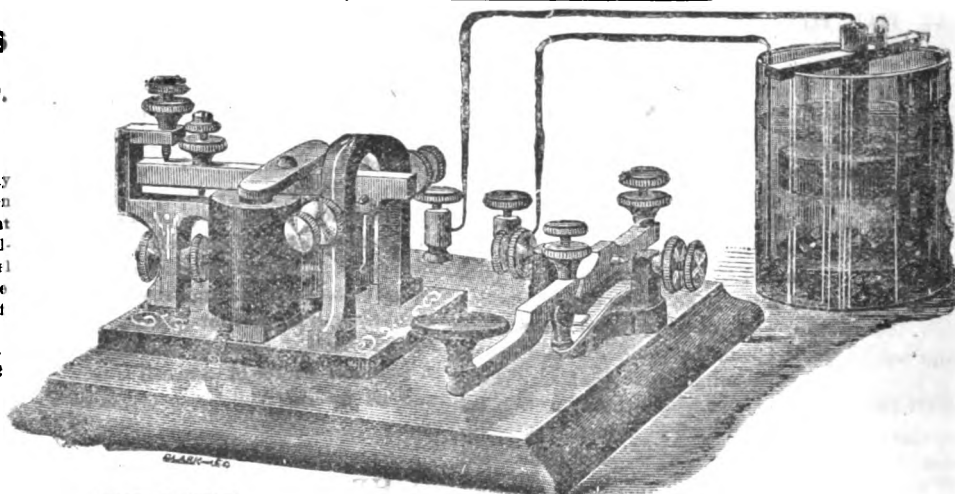
\$5.00 Or Short Line Instrument. \$5.00.

Not the Cheapest, but Guaranteed the Best !

THE PREMIUM LEARNERS' APPARATUS is manufactured especially to meet the demand for learners and for short lines of from one to ten miles in length. The outfit for a learner comprises the New Giant Sounder (Perfe cted), and the New Curved Key, placed upon a fine walnut base, one cell of Callaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction. Hundreds of young men and ladies have learned the art of Telegraphing with these Instruments and Book of Instruction without any other teacher.

Our Book of Instruction, which accompanies this instrument, contains the alphabet, with Examples and Lessons especially adapted to meet the wants of the beginner.

We Guarantee our Instruments as Represented.



| PRICES. | |
|--|---------|
| Complete Outfit, Money in advance..... | \$5.00 |
| Instrument, without Battery, Money in advance..... | 4.20 |
| " " " wound with finer wires for lines of 1 to 15 miles..... | 5.00 |
| Premium Sounder, Separate Base, Money in advance..... | 2.50 |
| Premium Key..... | 1.75 |
| Cell of Battery, Complete, Money in advance..... | .80 |
| Insulators, Porcelain, with Screws, Money in advance..... | .05 |
| No. 14 Gal. Iron Wire, per mile..... | 10.00 |
| Extra Zincs for Battery, each, " " "..... | .25 |
| Extra Coppers for Battery, each, Money in advance..... | .10 |
| " Hangers " " " "..... | .10 |
| " Jars " " " "..... | .35 |
| Small Office Wire, per foot, " " " "..... | ½ cent. |
| Premium Learners' Instrument, Key and Sounder entirely Nickel-plated, without Battery..... | 5.20 |
| Complete Nickel-plated Instrument, with Battery, etc..... | 6.00 |
| " " Sounder, Separate Base..... | 3.25 |
| " " Key " "..... | 2.00 |
| Instruction Book..... | .25 |

Battery Jars cannot be sent by mail.

Instruments without Battery, sent by mail, 55 cents extra. Remit by P. O. Money Order, Draft, Registered Letter or Express.

All of the above instruments we were the first to manufacture and put before the public, and we will guarantee the best goods for the least money, and know this is the verdict of the Telegraphic Profession.

Send for Catalogues and Circulars before purchasing elsewhere, and get the best manufactured.

PARTRICK & CARTER,
Manufacturers of the Best Telegraphic Instruments and Supplies,
114 South Second Street, Philadelphia. Pa.

A GREAT OFFER

To Superintendents, Managers, Purchasing Agents
and others having on hand

Worn Out, Damaged or Useless Morse Keys,

We will, until further notice, furnish our

New Steel Lever Keys

in exchange for all old keys for a cash difference of \$1.66 each. This price applies to any number of keys, no matter in what condition the old ones may be. They must be delivered to us, in packages plainly marked KEYS, with all charges PREPAID, and remittance should accompany the orders, except from Superintendents and Purchasing Agents of well-known Companies.

Now is the time, while the offer holds good, to get together all of your

Used-up and "Bad" Keys

and exchange them for splendid New Ones. See description and advertisement of Steel Lever Key. Send for circular.

J. H. BUNNELL & CO.,

112 Liberty Street, N. Y.

FREE !

Complete Instruction in Telegraphy

If you wish to know all about learning Telegraphy, constructing and operating Short Lines of Telegraph, &c., send your address, by postal card or letter, and get J. H. Bunnell & Co.'s Manual of Instruction for Learners of Telegraphy, latest edition, which we will send

FREE OF CHARGE,

to all who apply, by mail or otherwise.

It is the plainest and best book of instruction in Telegraphy ever published, being fully complete in description, explanation and illustrations.

J. H. Bunnell & Co.,

112 Liberty Street, N. Y.

THE AMERICAN BELL TELEPHONE COMPANY.

W. H. FORBES, *President*, W. K. DRIVER, *Treasurer*,

THEO. N. VAIL, *General Manager*.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses. This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

KERITE INSULATED

TELEGRAPH WIRES AND CABLES.

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession.

THE

DURABLE QUALITIES OF KERITE

RECOMMEND IT AS THE

CHEAPEST AND MOST ECONOMICAL
insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND
CABLES

of any number of conductors or size of insulation, furnished at short notice.

INSULATED WIRE

of all sizes for

OFFICE, LINE OR BATTERY USE
always on hand. Also for sale by all dealers in telegraphic material.

For further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

B. HOTCHKISS, General Agent.

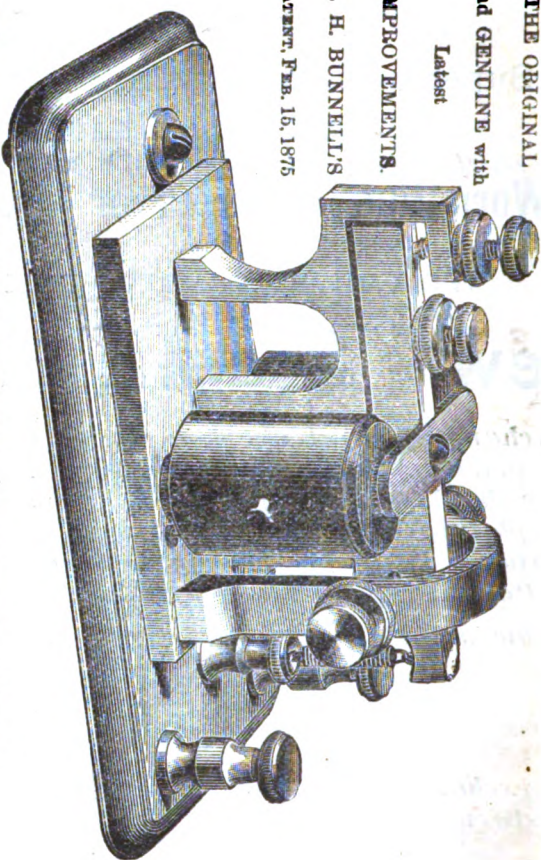
Another Great Reduction in Prices ! !

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS.

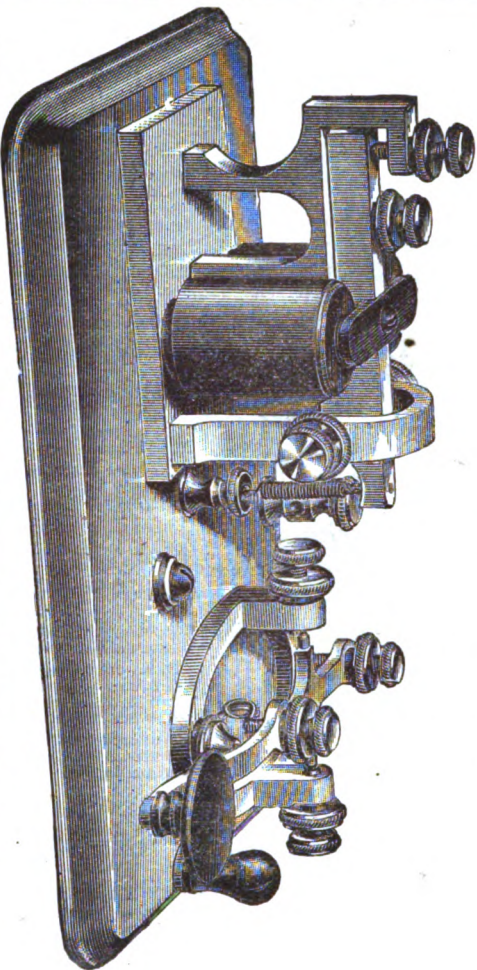
J. H. BUNNELL'S

PATENT, FEB. 15, 1875



THE GIANT SOUNDER—UNEQUALLED! \$4.00.

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$4.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

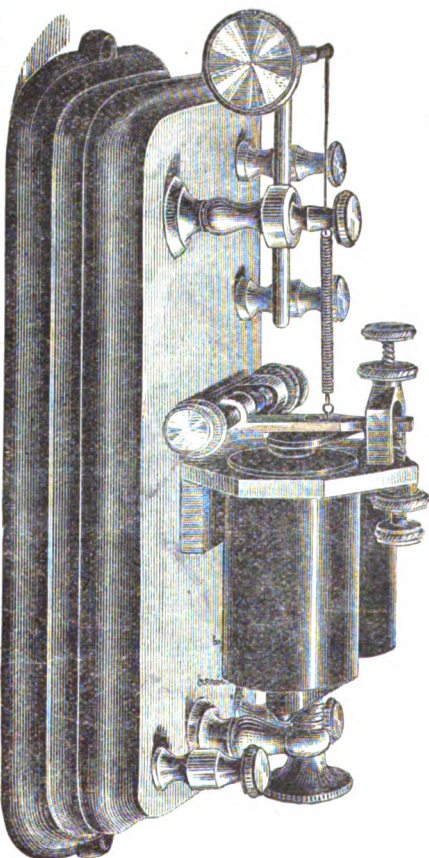
COMBINATION SET: \$7.50.

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$7.50, carefully boxed and sent by mail, prepaid, to any part of the United States.

All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.

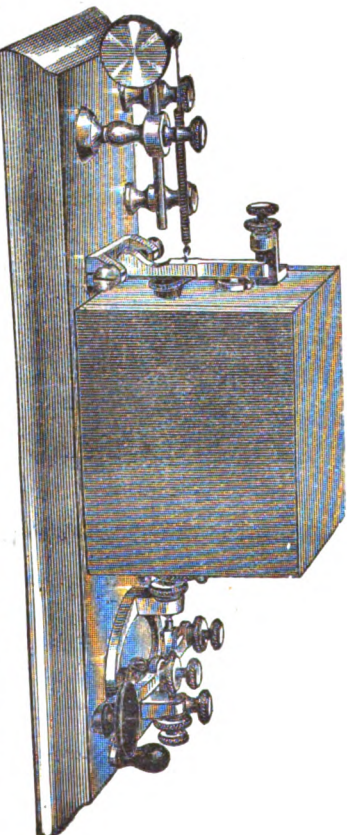
\$7.50.



FIRST CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Subbase, Extension Adjustment. Price, \$7.50.

\$11.00.



BOX SOUNDING RELAY AND STEEL LEVER KEY.

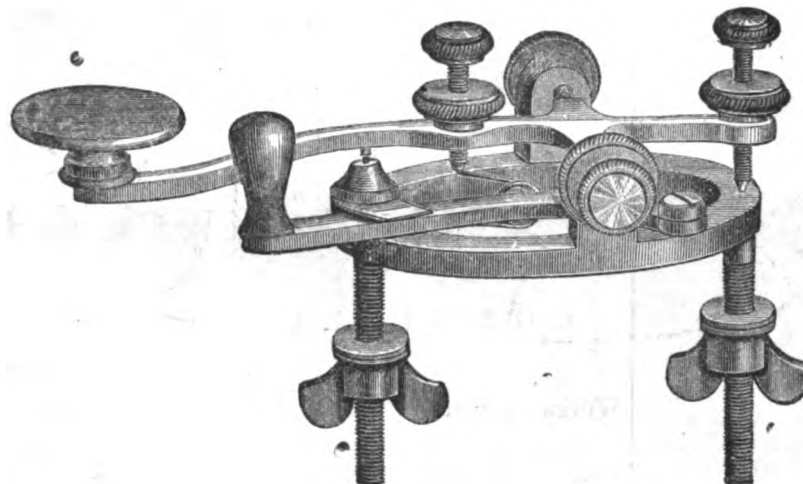
COMBINATION SET.

For Main Lines up to 800 miles in length. Of best construction for loud, clear sound without loss of sound. Polished Mahogany Box and Base; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$11.00; without Key, \$8.50.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:


The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Our Steel Lever Solid Trunnion Key

is now well known throughout the United States and Canadas as being the most satisfactory, durable and perfect key for Morse Telegraphing.

Its great popularity since its first introduction has caused many attempts to produce a key having at least equal merit. But, after two years' trial in thousands of different places, it still remains

“A Number 1,” Ahead of all,

while its competitors drop out and cease to be heard from.

Various absurd contrivances, more like Ticket Punches than Telegraph Keys continue to be put forward as being equal or better keys, but we would say to all who wish to possess a perfect instrument that

“The Bunnell Steel Lever Key”

is beyond all comparison,

THE BEST.

J. H. BUNNELL & CO.,

FIRST-CLASS TELEGRAPH INSTRUMENTS & MATERIALS OF EVERY DESCRIPTION,

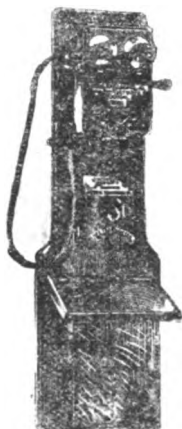
112 Liberty Street, New York,

CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.Magnet Crank and Push Button Call Bells, Electric Bells,
District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS.

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

Geo. WESTINGHOUSE, Jr., Pres. RALPH BASSETT, V. Pres. & Treas.
O. H. JACKSON, Gen'l Manager. ALFRED T. BOWARD, Secretary.
HENRY SWINER, General Agent.**THE UNION SWITCH & SIGNAL CO.,**

PITTSBURGH PENNA.

A consolidation of
The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
sole Owners and Manufacturers of the only practically suc-
cessfulSYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Elec-
tricity.Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnish-
ed upon application.

ESTABLISHED 1820.

ALFRED F. MOORE,

[Successor of JOSEPH MOORE & SONS.]

MANUFACTURER OF

INSULATED TELEGRAPH WIRES,

200 & 202 North Third St., corner of Race,

PHILADELPHIA, PA.

INSTRUMENT AND OFFICE WIRES. FLEXIBLE CORDS. ANNUN-
CIATOR AND BURGLAR ALARM WIRE. ELEVATOR CABLES.All wire used is thoroughly tested for conductivity, there-
fore ensuring purity and regularity of resistance.

SOLE MANUFACTURER OF

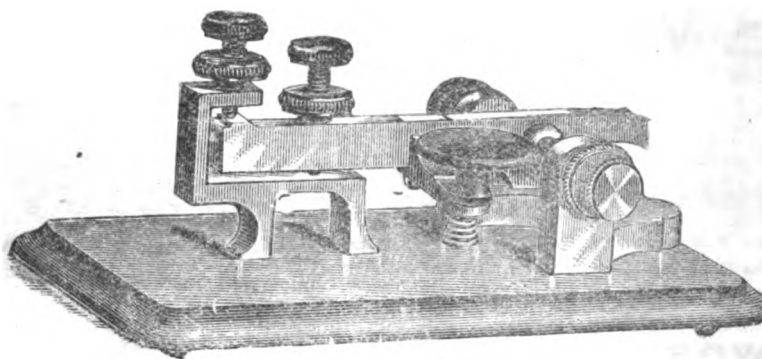
NICKERSON'S PATENT TIP

FOR FLEXIBLE CORDS.

Descriptive Circulars furnished upon application.

NEW MECHANICAL**TELEGRAPH INSTRUMENT.**

PATENTED APRIL 4, 1882.

**COMBINED KEY AND SOUNDER.****No BATTERY REQUIRED.**

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is *always ready for use*.Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or register-
ed letter.**J. H. BUNNELL & CO.,**

Telegraph and Telephone Supplies,

112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S**NEW, LARGE,****ILLUSTRATED CATALOGUES
OF MAY, 1882?**

If not, send your address by postal card or letter and you will get one by return mail

It contains Illustrations, descriptions, and the

BOTTOM PRICESof all things Telegraphic, including the latest and best designs of Telegraph Instru-
ments of every description, together with all Telegraph and Telephone**LINE MATERIALS.****TOOLS & SUPPLIES.**We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of**IMPROVED MODERN TELEGRAPH SERVICE.****J. H. BUNNELL & CO., 112 Liberty Street, New York.****FREE TO YOU**By Mail, on receipt of 25c. in currency or stamps,
**HOW TO BECOME A TELEGRAPH
OPERATOR.** The most complete illustrated

Telegraph Instruction Book in the world.

C. E. JONES & Bro.: Dear Sirs:—Instruction Book received O. K., and many thanks. It is worth five times what
it cost. If a person could not learn to be an operator after studying it, THEY HAD BETTER GIVE UP. Yours truly,

A. L. JAMES, Tipton, Tulare County, Cal.

NOW! RIGHT! NOW! while fresh in your mind, is the best time to send your order, before you
misplace this paper and forget our address, and your opportunity is gone.**C. E. JONES & BRO.,** Telegraph, Telephone and Electrical Supplies,
No. 51 West Fourth Street, CINCINNATI, O.

WESTERN ELECTRIC MANUFACTURING COMPANY.

220-232 KIRKIN STREET, CHICAGO.

62-68 NEW CHURCH STREET, NEW YORK.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES.

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANSON STAGER, President. ENOS M. BARTON, V.-Pres.

ELISHA GRAY, Electrician.

CATALOGUES

sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE |
|---|--------|-------|
| I—Complete Set of Catalogues..... | 286 | 20c. |
| II—Telegraph Instruments and Supplies..... | 64 | 6c. |
| IV—Insulated Wire (included in II) | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 82 | 30c. |
| VI—Electro-Medical Apparatus..... | 32 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 32 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 3c. |
| XI—Magnets for Mills..... | 20 | 5c. |
| Sir Wm. Thomson's Nautical Instruments.... | 24 | 5c. |

THE WESTERN ELECTRIC MANUFACTURING COMPANY,
62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE JOHN A. ROEBLING'S SONS COMPANY,

TRENTON, N. J.,

And No. 117 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF

GALVANIZED TELEGRAPH WIRE,

AND

PLAIN AND OILED WIRE OF SUPERIOR QUALITY,

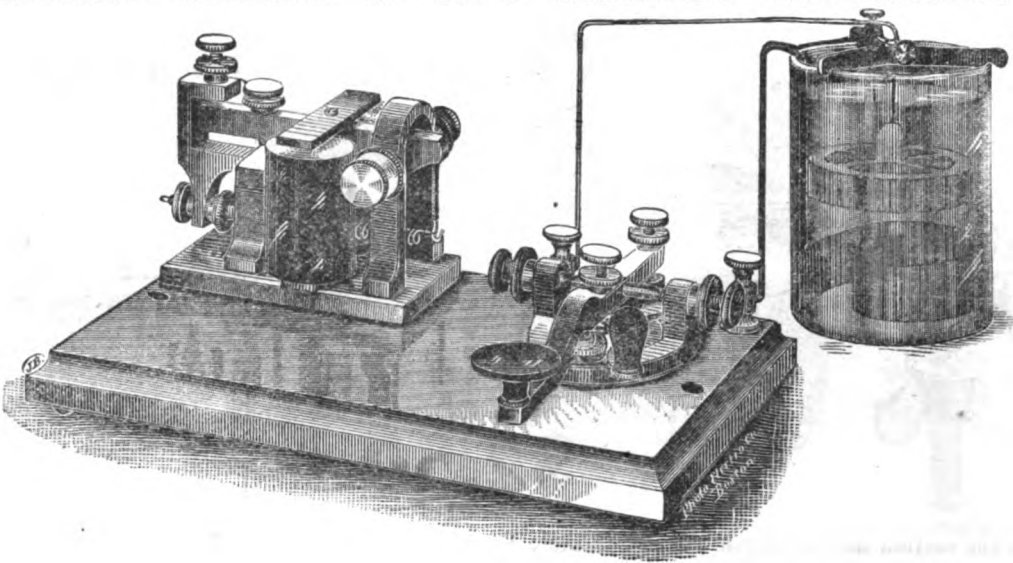
FROM SWEDISH CHARCOAL AND B B IRON.

BUT ONE JOINT PER BUNDLE.

POST & COMPANY,

Agents for Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



Price for the Complete "Gem" Learners' Outfit. \$3.75.

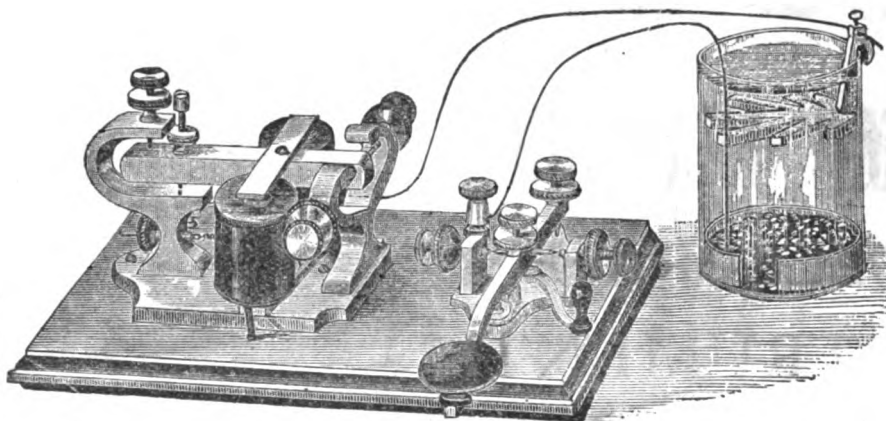
Consisting of the above large sized Sounder and Key, a large Cell of Callaud Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument that has nicely finished BRASS Sounder and Key Lever, with perfect adjustments for both.*

| | | | |
|---|--------|--|------|
| BRASS Sounder and Key Lever, with perfect adjustments for both. | | | |
| Price for Complete Outfit..... | \$3.75 | Price for Instrument alone, by mail, post-paid, \$3.60 | |
| “ Instrument alone..... | 3.06 | “ Instrument alone, for lines 1 to 15 miles..... | 3.60 |
| “ the whole outfit (except Glass Jar), with Key and Sounder separate, by mail, post-paid..... | 4.32 | “ Instrument alone, for lines 1 to 15 miles, by mail, post paid..... | 4.05 |

Send for Circular.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,
No. 30 Hanover Street, Boston, Mass.



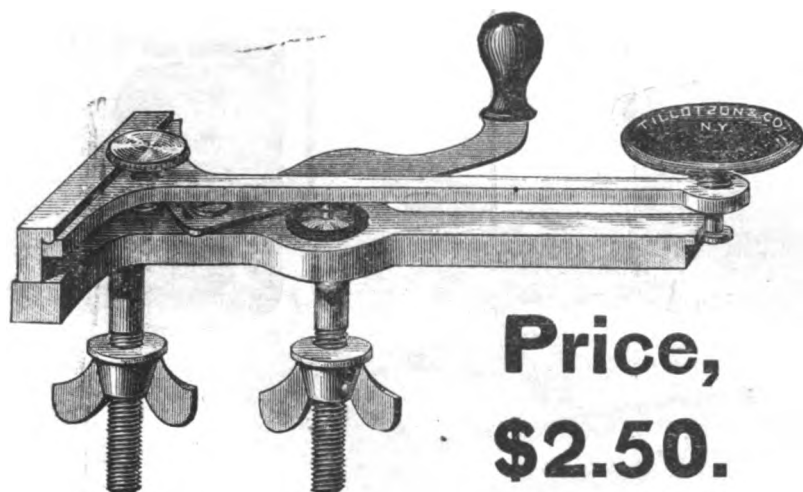
No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of Sounder, Key, either on 1 base or separate, 5x7, Callaud Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent C. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

This Key has Pure Platinum Points.

A. B. LYMAN, 36 South Water St., Cleveland, O.

THE "VICTOR" TELEGRAPH KEY.



**Price,
\$2.50.**

PATENT APPLIED FOR.

*The Greatest Improvement in Telegraph Keys
ever made.*

THE EASIEST WORKING.

THE MOST POSITIVE CONTACT.

The Lightest Lever.

The Most Perfect in Construction.

No Trunnion Connections.

No Side Motion to Lever.

No Back Adjusting Screw.

The Neatest, Nicest, Handiest and Best Key
in the World.

Since the earliest days of Morse Telegraphy there has been little or no radical change in Telegraph Keys until the invention of the Victor Key.

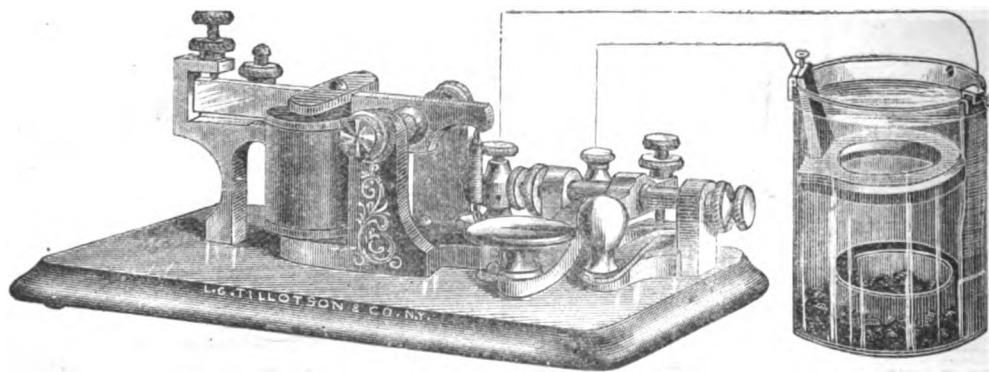
Telegraphers who take hold of the "Victor" Key will at once notice that there are but two points of adjustment to regulate. These are the play of the lever and the stiffness of the spring. There are no loose trunnions to tighten up, and no tight trunnions to loosen. The lever can never move to one side or the other; and the point can never be worn into wedge shape. The play of the lever must of necessity be directly up and down, without side motion; and consequently the points must always strike fairly and squarely. The imperfect trunnion connections of all old style keys are completely done away with in the "Victor," and the five minutes' labor of the "relief" operator in twisting adjustment screws to get his key lever to work "to suit" are at once ended. These are the most prominent points that will present themselves to the Telegrapher who uses the "Victor" key for the first time. Add thereto the light steel lever, which also prevents wearing of the connection, and the long leverage, and you have the two leading advantages claimed for the most perfectly improved of modern telegraph keys. By a turn of the knob to the left the play of the lever is decreased, or by a turn to the right it is increased, thus avoiding the imperfect set screw adjustment heretofore universally in use. These advantages present themselves so clearly and emphatically to every telegrapher that this key has only to be tried to receive the commendation already universally accorded it by every telegraph man who has examined it, which is "THE BEST KEY I EVER SAW."

To enable all to test the merits of this great invention, we will, on receipt of price, \$2.50, send, post-paid, by registered mail, to any part of the United States or Canada, a sample VICTOR KEY.

\$3.75. Great Reduction in Price \$3.75.

OF THE CELEBRATED

HOME LEARNERS' TELEGRAPH INSTRUMENTS



Owing to the great demand for these popular instruments, we have been compelled to enlarge our facilities for their production, and are now making them in such quantities as to admit of a considerable reduction in price, which reduction we now give our customers the advantage of. All of these Instruments will be manufactured as heretofore in the best manner, and they will be found the best Student's Apparatus in the market.

For the above Complete and Perfect Sounder and Key Combined, on mahogany base, including Battery, Chemicals, Wire, Book of Instruction and everything necessary for a first-class Telegraph Outfit for the Student's use, for practice at home, or for operating all Short Lines of Telegraph, net cash..... \$3.75
Instruments for short circuit, without Battery..... 3.00
Same by mail, post paid..... 3.50

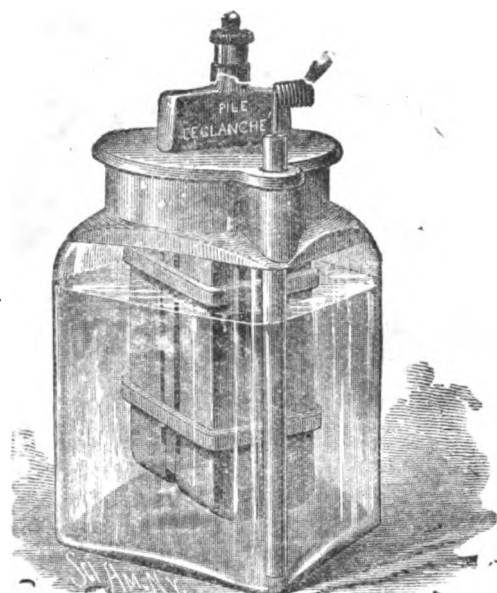
Instruments without Battery, wound with fine wire, for lines 1 to 15 miles..... \$3.75
Same by mail, post-paid..... 4.25
Cell of Battery..... .65
Instruction Book..... .30
Galvanized Telegraph Wire, per 100 feet..... .30

Remit by Postal Money Order, Draft or Registered Letter,

MANUFACTURED ONLY BY

L. G. TILLOTSON,

Manufacturers and Dealers in TELEGRAPH AND TELEPHONE SUPPLIES of Every Description,
Nos. 5 and 7 Dey Street, New York.

LECLANCHE BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company,
Western Union Telegraph Company

Gold and Stock Telegraph Company, with their battery telephones,
And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Pilaques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of IMITATIONS and WORTHLESS IMITATIONS.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity
Zinc and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,
149 West 18th St., New York.

Or L. G. TILLOTSON & CO.,
5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FISHBONE

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CARLIS, ETC.

OFFICE AND FACTORY: 67 STEWART STREET

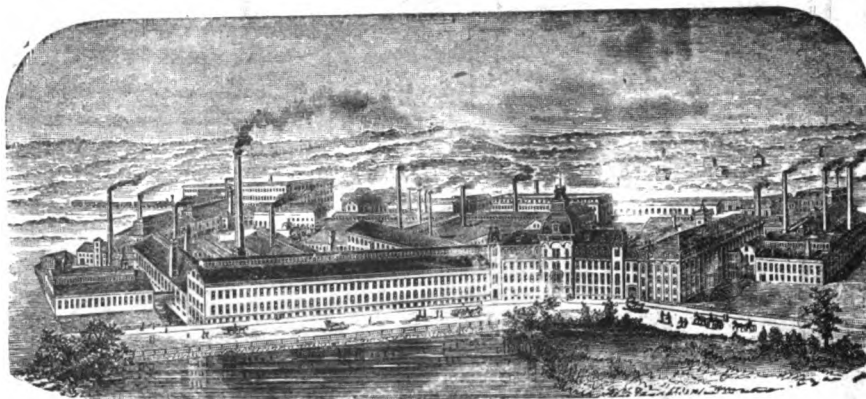
PROVIDENCE, R. I.

W. E. SAWYER, Electrician and Sup't.

TELEGRAPH WIRE.

WASHBURN & MOEN MANUFACTURING COMPANY.

ESTABLISHED 1851. CAPITAL \$1,500,000.



WORCESTER, MASS.

21 OLIVE STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequalled in that particular.
Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

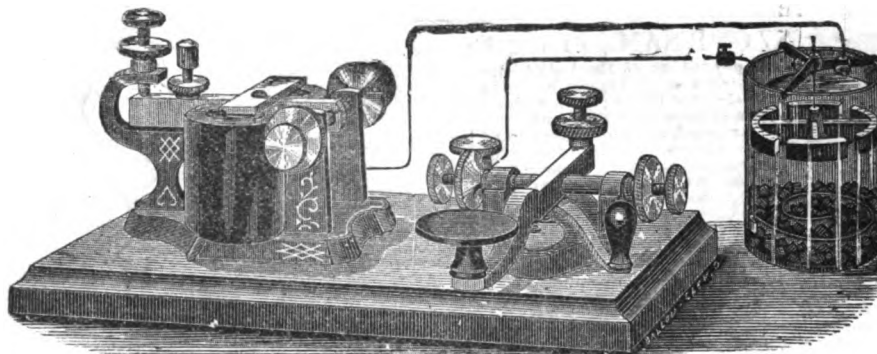
PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,
(In connection with the DOUGLAS STEEL FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.
Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.
N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

EUREKA OUTFIT NO. 2.

Price \$4.00.



ONE PACKAGE BLUE VITREOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

SENT ON RECEIPT OF \$4.00; OR SENT C. O. D. \$3.00 IF \$1.00 IS SENT WITH THE ORDER.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

144 Superior Street, Cleveland.

Operators' Cramps cured by

**LITTLE GIANT FRENCH BATTERY**

Relieves Rheumatism and all Nervous Complaints. Supersedes all others. Send for circular.

C. E. JONES & BRO.
Cincinnati, Ohio.

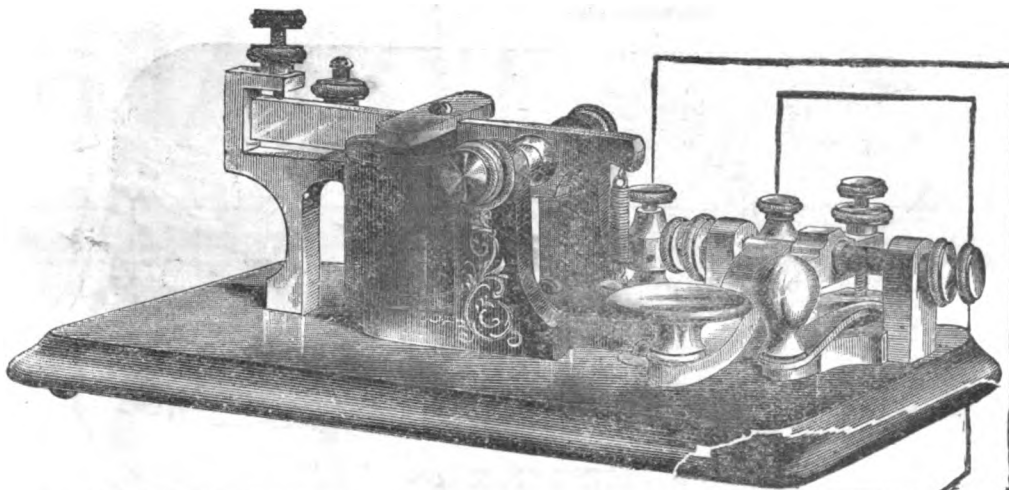
CEDAR TELEGRAPH POLES,

50,000 for SALE, by

H. C. RIPLEY,

East Saginaw, Mich.

The "Morse" Learners' Outfit \$3.75.

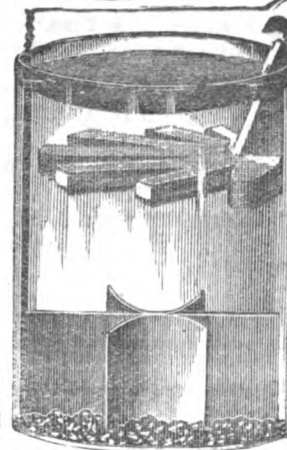


THE BEST.

Price, \$3.75, complete with Battery, Book of Instruction, Wire, Chemicals and all necessary materials for operating.
 "Morse" instrument alone, without battery..... \$3.00
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 3.75
 Cell of battery complete..... .65
 "Morse" Learners' Instrument, without battery, sent by mail..... 3.50
 (Battery cannot be sent by mail.)

Instruction Book FREE.

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.
 Remit by Draft, Postal Money Order, or Registered Letter.
 Favorable arrangements made with Agents everywhere.



**GREAT
REDUCTION
IN
PRICE!!
THE BEST.**

The "Morse"
 Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners, Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

**You are SURE of getting
THE BEST THAT IS MADE**

IF YOU SELECT THE "MORSE"

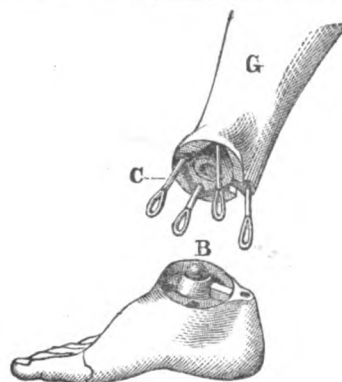
We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.



YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "73," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 either designs, with name, business and address, if desired, for \$1.00. Also Electrotypes Cards of Keys, Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents; also Embellished Keys 25 for 25 cents. Samples of Operators' Cards 10 cents. 50 New and laughable illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 25c. 25 side-splitting Comic Cards, 20c. Morocco card cases, two pockets, 10c. 100 finely printed letter heads, \$1.00. 100 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 10c. Agents Wanted to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also satin fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and -tipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200, no two alike, very funny, postpaid for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from 3 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,
F. P. MUNN, CLYDE, Wayne Co., N. Y.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
 With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.
GEO. R. FULLER,
 Successor to Dr. D. BLY, Rochester, N. Y.

IT PAYS to sell our Hial Printing Rubber Stamps.
 Samples Free C. FOLJAMSE,
 Successor to G. A. HARPER & BRO. Cleveland, O.

Found at Last. A CHEAP COUNTER CLIP,

(Patented July 13, 1882.)
 CHEAPER THAN PASTE.
 Blanks Removed Without Tearing.
 Price, post-paid, 15 cents. Per doz., post-paid, \$1.50.
 Discounts to the Trade or to Telegraph Co.s, in quantities.
 Larger sizes made to order to wall, for Paper Bags, Wrapping Paper, &c. Circulars free. Address,
W. W. PRICHARD,
 Ironton, Ohio.

SHORTHAND

Writing thoroughly taught by mail or personally. Situations procured for pupils when competent. Send for circular. **W. G. CHAFFEE, Oswego, N. Y.**

I will teach any operator the Corresponding Style of Phonography, who will sell a Calligraph for me.

HARBERT E. PAINE, late Comm'r Patents. STORY B. LADD,

PAINE & LADD,

Solicitors of Patents and Attorneys in Patent Cases,

Washington, D. C.

The Finn Lightning Arrester.



This new and improved Arrester will effectually short circuit all free electricity at a point outside any office or building.

Price—\$4.00 per dozen.
 \$30.00 per 100.

Samples by mail on receipt of 50 c.

For further particulars address or call upon

Finn Lightning Arrester Co
 Elyria, Ohio.



CALIGRAPHS SOLD and orders filled immediately.

STENOGRAPHERS furnished business men without charge for my services.

SHORT-HAND TAUGHT.

Send for circular to

W. G. CHAFFEE,
 Oswego, N. Y.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, SEPTEMBER 20, 1882.

WHOLE NO. 351.

QUARTERLY REPORT OF THE WESTERN UNION TELEGRAPH COMPANY, FOR THE QUARTER ENDING SEPTEMBER 30, 1882.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, September 13, 1882.

The following statement will show the condition of the Company at the close of the quarter ended June 30, 1882 :

| | |
|--|----------------------|
| Surplus April 1, 1882, as per last quarterly report..... | \$1,815,531 87 |
| Net revenues, quarter ended June 30, 1882..... | 1,675,691 68 |
| | <hr/> \$2,991,223 05 |

| | |
|---|----------------------|
| From which deducting appropriations for— | |
| Dividend of 1½ per cent., paid July 15..... | \$1,199,771 82 |
| Interest on bonded debt..... | 107,311 10 |
| Sinking funds | 20,000 00 |
| | <hr/> \$1,326,962 92 |

Leaves a surplus, July 1, 1882, of.....\$1,664,240 13

| | |
|--|----------------------|
| The net revenues for the quarter ending September 30, instant, based upon nearly completed returns for July, partial returns for August, and estimating the business for September, will be about..... | \$2,250,000 00 |
| Add surplus, July 1, as above..... | 1,664,240 13 |
| | <hr/> \$3,914,240 13 |

| | |
|-------------------------------|--------------------|
| From which appropriating for— | |
| Interest on bonded debt..... | \$106,850 00 |
| Sinking funds..... | 20,000 00 |
| | <hr/> \$126,850 00 |

| | |
|---|----------------|
| Leaves a balance of..... | \$3,787,390 13 |
| It requires for the payment of a dividend of 1½ per cent. on the Capital Stock..... | \$1,199,770 00 |
| | <hr/> |

| | |
|---|----------------|
| Deducting which leaves a surplus, after paying dividend, of | \$2,587,620 13 |
|---|----------------|

In view of the preceding statements, the committee recommend to the Board of Directors for adoption the following:

Resolved, That a dividend of one and one half per cent on the capital stock of this company be, and is hereby declared payable on and after the 16th day of October next, to stockholders of record at the close of business on the 20th day of September instant.

Resolved, That, for the purpose of such dividend, and for the annual meeting of stockholders, to be held on the 11th day of October, the stock books of the company be closed at three o'clock on the afternoon of the 20th day of September instant, and be reopened on the morning of the 17th of October next.

Respectfully submitted,
NORVIN GREEN,
President.

BOOK NOTICE.

THE MILITARY TELEGRAPH DURING OUR CIVIL WAR IN THE UNITED STATES.

By WILLIAM R. PLUM, LL. B., of the Chicago Bar, 2 vols. Portraits and Illustrations. Jansen, McClurg & Co., Chicago, 1882.

The object of this work is to show the valuable services rendered by the Military Telegraph in the late Civil War. In order to illustrate the importance of the Telegraph, and give it due setting, it was considered necessary by the author to give a running account of the struggle itself. In this the author says he has been greatly aided by important telegrams and other papers, official and otherwise, which have never been published, and by many southern operators who have furnished interesting and important facts from their point of view.

In addition to giving a history of the military telegraph during the war, it has an exposition of the ancient and modern means of communication in war and a running account of the war between the States; of the use of the telegraph; it treats of its initial State and early operations; its growth and service in the several departments.

The work has fourteen portraits of persons who were prominent in this branch of the service. These are steel portraits of Gen. Anson Stager and Gen. Thomas T. Eckert. There is much biographical matter also which cannot be ascertained elsewhere. There are many maps and illustrations to interest and instruct the reader.

After reading this work it is plain that without its subject matter, which has been mostly omitted in other histories and annals, a correct idea of the system and management of the civil war, on either side, cannot be obtained.

The nation at large own a debt of gratitude to Mr. Plum for the enthusiastic and thorough manner in which he took hold and carried through this great work, which it seems it was his mission to do, for it was left entirely to him, he was the only reaper and gleaner that occupied this part of the field which he has shown to be so fruitful. It is here garnered ready for the use of all.

It is safe to say that no careful historical writer on American history will hereafter neglect to consult its pages and draw bountifully from the information it contains.

The addition of this work to historical writing, leads us to reflect upon the advance and improvement which all historical writers have made during the past decade, and, more notable still, during the past ten years. An examination of these late works prepared by English and American writers, shows us how few good and satisfactory histories there are—they can all be counted on the fingers of both hands. There are Hume, Gibbon, Robertson and Hallam that will always stand first in bold relief, but there are later historical writers that gives us more satisfaction when we wish to trace some par-

ticular line is history. We will not name the great historical writers on American subjects, but leave them to be ascertained by readers who are or ought to be interested in finding them out.

The style is excellent, and there is nothing tedious in it from the beginning of the first volume to the end of the second.

ELECTRICAL CONGRESS.

On October 11 there will be a Congress of Electricians in Paris. Among other subjects to come before the members will be the determination of the length of the mercury column equivalent to the practical ohm; the construction of lightning conductors and the influence of telegraph and other wires on electric storms; the means of establishing a general system for observing electricity, and the meteorological importance of the transmission of intelligence by electricity. A Diplomatic Congress will also consider the subject of telegraph cable protection. It is thought that M. Coochery will preside over the former meeting and M. Duclerc over the latter.

ELECTICAL UNITS.

The International Electrical Congress held in Paris, decided to make use of the centimeter, gramme and second in all electrical measurements. They will retain the practical units, "ohm" for resistance, and "volt" for electromotive force. The intensity of a current produced by one volt, with a resistance of one ohm, will be called one "ampère;" and the quantity of electricity given by one ampère in one second will be called a "coulomb;" the term "farad" indicates the capacity of the condenser which, laden with a volt, holds one coulomb of electricity. The old term "weber," as unit of intensity of current will not be used.

The President of the British Association for the Advancement of Science this year—Dr. Charles William Siemens—is not a native of Great Britain. When he was 19 years of age he arrived in England with a stout heart but with little or no money. He took with him from Germany some improvements in the methods of electro-plating, and a Birmingham firm taking hold of them he received his first substantial start in life.

An Exhibition of Practical Electrical Development, with reference chiefly to telephones, electric lightning, transmission of power, and the economical application of electric energy to practical work, will be held in the Royal Aquarium, Westminster, England, from November 1 of this year to March 1, 1883. Prizes amounting to \$5,000 will be awarded by a committee which the scientific societies will be invited to nominate. The time granted for the application for space is now closed.

Journal of the Telegraph.

PUBLISHED MONTHLY, ON 20TH OF EACH MONTH, AT
195 BROADWAY.

THE JOURNAL is issued on the 20th of each month. Its circulation is over 15,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,750 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....\$ 1 50
One Copy, six months, postage included..... .75
Single Copies, 15 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$ 2.00
Half Inch " " "..... 1.00
Quarter Column, " " "..... 4.00
Half " " "..... 8.00
One " " "..... 16.00

Cuts charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, SEPTEMBER 20, 1882.

REMARKS OF PRESIDENT GREEN TO THE BOARD OF DIRECTORS.

I DEEM it proper that I should announce to the Board my purpose to retire from the Presidency of the Company at the end of my present term. I had promised myself and family that I would not undertake to perform the very responsible and wearing duties of the position for a longer period than five years; and I shall make to the annual meeting of stockholders in October my fifth annual report.

FIVE YEARS GROWTH AND INCREASE.

The statistics for that report are in hand, and compared with the last annual report of my predecessor for the fiscal year ending June 30, 1877, it will exhibit gross receipts of over \$17,100,000.00 and net profits of over \$7,100,000.00 as against gross receipts of \$9,800,000.00, and net profits of \$3,100,000.00 for the year referred to, showing an increase in five years of over 80 per cent. in the gross revenues, and of over 130 per cent. in the net profits, whilst the rate of expenditures has been reduced from 69 per cent. to 58 per cent. of the gross revenues. And this, notwithstanding the steady and very considerable reductions in rates.

During this period of five years, the mileage of lines has been increased from 76,955 to 131,032, and of wires from 194,233 to 374,294 miles. The number of offices from 7,500 to 12,050, and the number of messages from 21,158,941 to 39,000,000, not including messages sent over wires leased to the press and to brokers, and a very large number of messages sent for railway companies, of which no account is taken. Showing an increase of over 90 per cent. in the plant, 60 per cent. in the number of offices, and (including the growing railroad service) of more than 100 per cent. in the amount of work done over the wires.

PROSPECTIVE INCREASE.

The same rate of increase for the next five years will produce gross revenues of thirty one and a half millions, and net profits of sixteen millions per annum. But as the growth of the Company has been in an increasing ratio—each five years showing a

larger percentage of increase than the preceding five years—we may reasonably expect a still greater ratio of growth and therefore even larger figures for the year ending in 1887 than those above presented, enormous as they now appear.

PECULIAR ADVANTAGES.

Nine-tenths of the lines are erected upon railroad routes, under contracts of great value to the Company. In all instances we have free transportation of men and material on the lines of the respective roads; and in most cases the railroad companies furnish the labor for maintenance and repairs; we pay salaries at only 2,578 of our 12,041 offices, and at 960 others we pay only a portion of the operating expense, leaving over 9,000 offices which are maintained and operated for us by railway companies in consideration of the large telegraph service performed by us for them.

A great many of our railroad contracts have been renewed during the past five years; most of them for long terms. The position of the company has been greatly strengthened by these renewals, and by the rulings of the courts as to the validity of our agreements.

VALUABLE ASSETS.

The dividend paying stocks in the Treasury, amounting to \$7,845,700, are now yielding to the company in regular dividends \$500,346 per annum, being nearly \$100,000 in excess of the fixed liabilities payable out of net earnings for interest and sinking fund on bonded debt; the rentals for lines leased from other companies being charged to current expenses before net earnings are stated.

IMPREGNABILITY.

Considering these facts I need scarcely say that successful competition with your Company is improbable, if not actually impossible. The addition of 180,000 miles of wire in the past five years is at the rate of 36,000 miles per annum, which is more than all the opposition companies together have ever constructed and probably more than they ever can construct in any single year. With 375,000 miles of wire already in operation, you will add to your system each year a mileage of wire greater than all the competing companies are likely to erect during the same period.

A large number of the 9,000 offices operated for your company by the railway companies, and producing in the aggregate a handsome revenue, would be necessary for testing and repairing stations to an opposition company competing for the business of the entire country; and would have to be maintained at a cost vastly greater than the entire receipts at those stations; while these offices are not only maintained and operated for your company, but the lines are literally patrolled and breaks are often promptly repaired by railroad employees.

It is a great mistake to suppose that by connecting the principal commercial centers a competition may be established for the greater part of the telegraph business. Although it is true that a few hundred offices take in most of the receipts of your company, comparatively a small portion of these receipts accrues on business between those offices. By far the greater part of the revenues is derived from business between the principal offices and the smaller stations in the system; 11,000 of which stations have never yet been reached by any competing company.

Your company has attained such magnitude and strength that it is no longer necessary to buy off any opposition; and I advise that it shall not do so at any price which will pay a profit to the projectors. Competition may be a popular demand, and it may be good policy on the part of your company to in-

dulge competing lines between the principal points. This would not materially interfere with remunerative dividends and the continued growth of the company.

CAPITALIZATION.

Before the end of the present year you will have about 400,000 miles of wire, which will make your capital stock just \$200 per mile, including your valuable patents, franchises, real estate and assets in the Treasury, exceeding in their market value your comparatively small bonded debt, by several millions. Considering the great cost of city lines, of cables for river crossings, and of lines to the Pacific slope, where the freights on poles and wires far exceed their first cost, it is doubtful that the property could be reproduced to day for that sum and leave any material margin for profit.

The capitalization of this company resulting from the consolidation of a number of small companies, was, sixteen years ago, and for several years thereafter, much too large. Then with 37,000 miles of pole line and 75,000 miles of wire, the capital stock was over \$41,000,000, and the bonded debt was about the same as now, exclusive of the bonds on the building in New York City. Now with five times the plant, large acquisitions of real estate, and over eight millions in value of convertible assets, the stock has been less than doubled. The capitalization was then about \$600 per mile of wire and is now less than \$200, after deducting assets and valuable properties.

It is, therefore, not just to designate the recent increases as watering the stock. The seventeen per cent. stock dividend made four years ago was but a re-distribution of stock in the Treasury, which had been purchased with earnings and belonged to the stockholders. The more recent dividend in stock was but a capitalization of surplus invested in new properties at their cost value to this company, when their actual value was from two to three times greater than their cost. It is this power in the charter of the company under the laws of the State of New York, which has made the Western Union Company the central figure and absorbent of all the scattered telegraph companies in the country, and enabled it to give to this continent the best telegraph service now being performed in the world, and at the lowest rates, considering distances.

But modern commercial law predicates the value of corporation securities, and generally the amount of their capitalization, on their earning capacity. On this basis, the earnings of your company above fixed liabilities are over six per cent. on one hundred millions of dollars and a handsome margin for new constructions.

ACKNOWLEDGMENTS.

I think I have fully appreciated the honor of the high and responsible position to which you have repeatedly elected me; and I gratefully acknowledge my obligations for the undivided confidence and support you have so uniformly extended to me; whilst I have tried to redeem my pledge to give to the interest of the company the very best service of which I was capable. I must also acknowledge the able, willing and most valuable assistance during the entire period of Vice President Van Horne, the Auditor, Secretary and Treasurer; and during the past two years, of Vice President and General Manager Eckert and his efficient staff.

CONCLUSION.

In yielding up to you the vast interests confided to my charge, I shall be able to say with pride and pleasure, that I leave this great company more prosperous and powerful than it has ever been at any previous period of its existence.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, September 20, 1882.

To all offices on Western Union lines:

The third paragraph of the order in regard to the treatment of franked messages to and from the Great North Western Telegraph Company's offices printed in JOURNAL March 20, 1882—should read:

On messages offered by parties holding Western Union Franks, charge 25 and 2 (instead of 26 and 1) and check thus, for example, etc.

CHANGES.

The following changes which have been made since August 20, 1882, should be entered in the Tariff Book as they will not be republished.

ALABAMA.

- * Lafayette, now 25 3 (25 1 N. M.) Opelika.
- 305 Repton, closed.
- 266 Stonewall, C. Co., closed.

ARKANSAS.

- * Camden, now W. Union office. Square 441.

CALIFORNIA.

- * * * Alviso, now * Alviso 25 2 San Jose.
- 772 Cambria, closed.
- * Glenbrook, Lake Co. closed.
- 816 Hopland, closed.
- 808 Marshalls, closed.
- * Orland, now W. Union office. Square 807.
- 771 Plainsburg, closed.
- 827 Point Arenas, reopened.
- 781 Ripon, closed.
- 808 Tyrone, closed.
- 823 Upper Matole, closed.

COLORADO.

- 598 Slaights, reopened.
- 566 Wheeler, closed.

CONNECTICUT.

- 29 Crescent Beach, closed.
- Forestville, now 15 0 by telephone, Bristol
- Oakville, now 15 0 by telephone, Waterbury.
- Poquannock, now 15 0 by telephone, Hartford.
- Shelton, now 15 0 by telephone, Birmingham.
- Uncasville, now 15 0 by telephone, New London.
- Union City, now 15 0 by telephone, Waterbury.
- Waterville, now 15 0 by telephone, Waterbury.
- West Haven, now 15 0 by telephone, New Haven.

FLORIDA.

- 318 Molino, closed.

GEORGIA.

- * Whiteburg, reopened 25 2 (25 1 N. M.) Newnan.

ILLINOIS.

- 297 Lake Bluff, closed.

INDIANA.

- * Georgetown, is in Brown Co.
- Grandview, now 25 2 by telephone, Evansville.
- 272 Velonia, reopened.
- Cannelton, Tell City and Troy, now 35 3 by telephone, Evansville.

KENTUCKY.

- Morganfield, now telephone office, 15 1 Mt. Vernon,
- Ind., or 25 2 Henderson, Ky.
- Uniontown, now 25 2 by telephone, Henderson.

LOUISIANA.

- * Farmersville, now 75 5 Trenton.
- 403 Trenton, reopened.

MANITOBA.

The state rate from offices in Manitoba to offices in Minnesota will on and after October 1, 1882, be 60 and 4 instead of 75 and 5 as at present. Manitoba offices should make the necessary corrections on their State rate.

Stonewall, closed.

Erase Battleford, Edmonton, Humboldt, and Swan River from list of Manitoba offices; they are in North West Territory. See new offices.

MARYLAND.

- 54 Ocean City, now * Ocean City, 25 1 Philadelphia, Pa.

MASSACHUSETTS.

- 21 East Saugus, closed.
- 21 Nantasket House, Nantasket Beach, closed.

MINNESOTA.

The State rate from offices in Minnesota to offices in Manitoba will on and after October 1, 1882, be 60 and 4 instead of 75 5 as at present. Minnesota offices should make the necessary corrections on their State rate sheet.

MISSOURI.

- * St Joe Lead Mines, changed to Bonne Terre,
- 428 Sweet Springs, closed.

MONTANA.

- * Coulson, closed.

NEW BRUNSWICK.

- 3 Ferris, changed to 3 Kent Junction.

NEW HAMPSHIRE.

- 17 Boars Head, closed.
- 17 Farragut House, closed.
- 17 Sea View House, closed.
- 17 So. New Market, closed.
- 17 Wentworth Hotel, closed.

NEW JERSEY.

- 47 Bellevue, closed.
- 56 Wenona, erase "Ck. Woodbury."
- 59 Westville, erase "Ck. Woodbury."

NEW MEXICO.

- 559 Otero, closed.

NEW YORK.

- 64 Constableville, reopened.
- 40 Hotel Kaaterskill, closed.
- * Kattskill House closes Sept. 27, 1882.
- 33 Manhasset House, Shelter Island, closed.
- 92 Montezuma, closed.
- * Pearl Point, closed.
- 139 Point Chautauque, closed.
- 46 Southfield, erase "P. O. Monroe Works."
- 38 Woodburg, closed.

OHIO.

- * * Soldiers' Home, under Dayton, in Tariff Book, now free from Dayton.
- Lakeside, closed.
- * * No. Toledo, now W. Union office. Square 211.

ONTARIO.

- Bedford, P. O. Godfrey.
- Belle Ewart, Belle Corners, Bertie and Bonnechere Point closed.
- Brown's Wharf, changed to Treadwell.
- Burnstown, Chelsea, Cherry Valley and Cameron, closed.
- Clarkeville, changed to Beaton.
- Dundall, should read Dundak.
- Duffins Creek, changed to Pickering.
- Galetta, Harley and Henfryn, closed.
- Innerskip Sta., should read Innerskip Sta.
- Kars, Kippen and Lowville, closed.
- Manotic, should read Manotick.
- Melbourne, changed to Wendigo.
- Mildford, should read Mildford.
- Milburn, Minden Sta, Minesing, Muskoka Wharf, Newry Sta., New Edinburgh, No. Williamsburg, Parry Harbor, Phil-
lipsburg, Port Whitby, Sombra, Stroud and Wilkesport, closed.
- Wyvale Sta., should read Wyevale Sta

OREGON.

- 813 Cottage Grove, closed.
- 797 Phoenix, closed.
- * Scio, now * * Scio, 100 0 West Scio.

PENNSYLVANIA.

- 59 Abattoir Drove Yards, erase "Ok. Philadelphia"
- 150 Avonia, E Co., now * Avonia, E Co., 10 0 by telephone,
- Fairview, Erie Co.
- 140 Clintonville, Ck. Petrolia.
- 111 Davis City, closed.
- * Fairview, E. Co., now W. Union Office, square 150.
- 59 Frankford, Ck. Philadelphia.
- 59 Kensington Depot, Ck. Philadelphia.
- 59 League Island Navy Yard, Ok, Philadelphia.
- 59 Mount Airy, erase the words "Tariff same as Philadelphia"
- 59 New York Junc., changed to 59 Sixteenth St. Sta.
- 47 Torresdale P. O. care Philadelphia.

QUEBEC.

- Boucherville Village and Chalk River, closed.
- Clorydorne, should read Chlorydorne.
- Cote St. Paul and East Templeton, closed.
- Green's Wharf, changed to Greece's Point.
- Greenville Wharf, Jacques Cartier Bridge, Lake St. John
- Junc., Murray Bay Wharf, Point au Pic Wharf, Port Neuf,
- Ross Sta., Stamford and St. Alexis, closed.
- St. Julien, should read St. Julie.
- St. Julien Sta., should read St. Julie Sta.
- St. Anne de Beaupre, St. Roch des Aulnais, Sandy Bay
- and Uhtoff, closed.

RHODE ISLAND.

- 18 Drownville, reopened.
- 22 Watch Hill, closed.

TENNESSEE.

- 256 Manchester, closed.

TEXAS.

The "other" line offices in Texas given in Tariff Book with rates from Galveston, are no longer night message offices.

- 460 Morris, closed.
- 483 Stevenson, changed to 483 Edgewood.

UTAH.

- 704 Deep Creek, closed.
- * Silver Reef, now 100 7 Salt Lake City.

VERMONT.

Barnumsville, Cambridgeport, North Londonderry, Peru and Saxton's River, all new 15 1 Factory Point or Bellows Falls.

- 23 Wenlock, closed.

VIRGINIA.

- 69 Ocean View, closed.
- 113 Orkney Springs, closed.
- 153 Sweet Chalybeate Springs, closed.

CENTRAL AND SO. AMERICAN MESSAGES.

ACCOUNTS AND REPORTS.

The JOURNAL of August 20, 1882, contains a list of the telegraph stations of the Central and South American Telegraph Company, and a notice that the rules for the acceptance and treatment of messages to such stations are the same as those for messages to the Atlantic Cables. A separate record of such messages, and a separate report, on blank No. 67, will therefore be necessary, and care must be taken that messages in this record and report are only those to and from the Central and South American Company's stations named in the JOURNAL above referred to.

OFFICES HAVING SPECIAL SHEET "L"

Will add Georgetown, D. C., to sheet "L" and make rate thereto same as to Washington, D. C.

Messages of the U. S. Government are transmitted free over the U. S. Military Tel Lines. On such messages it will be necessary to collect tolls for "this" line only. Offices on the U. S. Military lines are those in Arizona, Dakota, Indian Terr., Montana, New Mexico, North Carolina and Texas, marked with a dagger, thus for example; (see page 5 of Tariff Book) * Dos Cabezas †, etc.; and * Prescott †, etc.

ATLANTIC CABLE.

The following is published for the information of managers who failed to note the change in cable rate made May 22, 1882, and announced in JOURNAL of May 20, 1882.

RATES TO GREAT BRITAIN, IRELAND AND FRANCE.

| | Rate per word. |
|---|-------------------|
| From Brooklyn, New York City and Yonkers in N. Y., the New England States, New Brunswick, Nova Scotia, Ontario and Quebec..... | \$0 50 |
| From New York (except Brooklyn, New York City and Yonkers), New Jersey, Pennsylvania, Delaware, Maryland, and District of Columbia..... | 53 |
| From Virginia, West Virginia, Ohio, Michigan, Indiana, Kentucky, Illinois, St. Louis in Missouri and Milwaukee in Wisconsin..... | 55 |
| From North Carolina, South Carolina, Georgia, Alabama, Mississippi, New Orleans in Louisiana, Tennessee, Denver and Leadville in Colorado, and W. Union offices in Florida..... | 60 |
| From Louisiana, (except New Orleans), Texas, Wisconsin (except Milwaukee), Iowa, Missouri (except St. Louis), Arkansas, Minnesota, Dakota, Manitoba, Kansas, Nebraska and Indian Territory..... | 65 |
| From Colorado (except Denver and Leadville), Wyoming, Utah, New Mexico, Idaho, Montana, Nevada, California, Arizona, Oregon and Washington Territory..... | 70 |
| From British Columbia..... | 75 |

A cable has been laid to Port Said in Egypt. The rate from London to Port Said is fifty cents per word. Messages should be accepted at sender's risk only, and should be marked via Falmouth.

Communication established with Cairo in Egypt via Port Said. Rate from London to Cairo fifty cents per word. Messages must be marked "Via Port Said."

CUBA CABLE.

The cable between Jamaica and Colon interrupted. During the interruption deduct 75 cents per word on messages to Colon, Panama and places south.

NEW OFFICES.

The list of new offices in this number of the JOURNAL has reached a length which will no longer admit of extension. It will therefore be necessary for managers to take special pains to preserve this number, as none of the names given under the heading "New Offices" will appear in the JOURNALS of future dates.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

| | | |
|-----------------|----------------|----------------|
| 318 Akron | 323 Cuba | 267 Notasulga. |
| 285 Bangor | 323 Epsa | 324 Prichards. |
| 294 Briarfield. | 293 Falkville. | 266 Stock Mill |
| 294 Calera. | | |

- * Alexander City, 40 3 (25 1 N. M. rate) Opelika.
- * Dadeville 40 3 (25 1 N. M. rate) Opelika.
- * Ft. Morgan, 75 5 Mobile.
- * Gainesville, 25 2 Epsa.
- * Goodwater, 40 3 (25 2 N. M. rate) Opelika.
- * Point Clear, 50 3 Mobile.
- * Round Mountain, free telephone, Collinsville.

ARIZONA.

| | | |
|--------------------|--------------------|-----------------|
| 646 Adonde. | 640 Dragon Summit. | 642 Picocho. |
| 639 Bowie Station. | mit. | 645 Sentinel. |
| 660 Canon Diablo. | 660 Flagstaff. | 645 Texas Hill. |
| 641 Contention. | 644 Gila Bend. | 661 Williams. |
| | 659 Holbrook. | 659 Winslow. |

- * Butte City, 50 4 Casa Grande.
- * Pinal, 50 4 (30 2 N. M. rate) Casa Grande.
- * Silver King 50 4 (30 2 N. M. rate) Casa Grande.

ARKANSAS.

| | | |
|------------------|------------------|----------------|
| 449 Brentwood. | 391 Jacksonport. | 401 Russell. |
| 371 Nettleton. | 381 Nettleton. | 381 Vandall. |
| 371 Gainesville. | 381 Palestine. | 449 West Fork. |
| 381 Harrisburg. | 371 Parney. | 449 Winslow. |
| 371 Knobel. | | |

- * Jonesboro 25 2 Birds Point, Mo.
- * Rector 25 2 Birds Point, Mo.
- * Paragould 25 2 Birds Point, Mo.
- * Warren 50 4 Pine Bluff.

BRITISH COLUMBIA.

- * Bentons, 50 3 Suras.

CALIFORNIA.

| | | |
|---------------------|---------------------|----------------------|
| 800 Alameda Point. | 800 Decoto. | 730 San Pedro. |
| 800 Alameda. | 713 Indio. | 720 Seven Palms. |
| 827 Albion Mills. | 718 Mammoth Tank. | 826 Table Bluff. |
| 754 Berenda. | 799 Norman Station. | 713 Volcano Springs. |
| Cape Mendocino. | 300 Ocean View. | 827 Whitesboro. |
| 647 Ocutus. | 770 Pina. | |
| 791 Coopers Switch. | 720 San Geronimo. | |

* Bidwell's Bridge, 25 2 by telephone, Greenville.

* Fall Brook, 40 3 San Diego.

* Glenwood 25 2 San Jose.

* Lafayette, 15 2 by telephone, Martinez.

* Leesville, 50 3 Colusa.

* Magalia, free, telephone, Oroville.

* National City, 25 2 San Diego.

* Walnut Creek, 15 2 by telephone, Martinez.

COLORADO.

| | | |
|-----------------------|------------------|-----------------------|
| 546 Agate. | 555 Frisco. | 557 Red Cliff. |
| 546 Bennett. | 545 Hardin. | 534 Rockwood. |
| 555 Bonas. | 590 Holleys. | 528 Sapinero. |
| 528 Browns Canon. | 599 Hortense. | 528 Sargents. |
| 528 Buffalo, Weld Co. | 528 Hot Springs. | 536 Sedgwick. |
| 540 Calumet. | 534 Ignacio. | 545 Snyder. |
| 552 Carr. | 540 Iliff. | 558 South Pueblo. |
| Cedar Creek Di- | 528 Kesar. | 552 Stout. |
| vide. | 552 La Salle. | 559 Tennessee. |
| Cimarron. | 558 Oak Creek. | 592 Timpas. |
| 540 Crook. | 528 Ohio City. | 599 Twin Lakes. |
| 545 Deuel. | 545 Orchard. | 599 Woodstock. |
| 533 Douglas. | 557 Pine Grove. | 559 Wootton, Ok. Mor- |
| 559 Earle. | 550 Pinon. | ley. |

- * Akron, (N. M.) 65 4 Plattsmouth, Neb.
- * Allens 25 1 Gunnison.
- * Ashcroft (N. M.) 75 5 Gunnison.
- * Aspen (N. M.) 85 6 Gunnison.
- * Blair, (N. M.) 75 5 Plattsmouth, Neb.
- * Bonanza (N. M.), 25 2 Villa Grove.
- * Conejos, 25 0 Antonito.
- * Eckley (N. M.) 60 4 Plattsmouth, Neb.
- * Elbert, (N. M.) 40 3 Denver.
- * Elizabeth, (N. M.) 25 2 Denver.
- * Empire, 25 2 telephone, Georgetown.
- * Franceville, (N. M.) 40 3 Denver.
- * Hyde, (N. M.) 60 4 Plattsmouth, Neb.
- * McConnellsville, (N. M.) 40 3 Denver.
- * Manitou Junc., (N. M.) 40 3 Denver.
- * Parkers, (N. M.) 25 2 Denver.
- * Platte Summit, 75 5 Plattsmouth, Neb.
- * Querida, 40 3 telephone, Silver Cliff.
- * Rock Springs (N. M.) 65 4 Plattsmouth, Neb.
- * Saguache 25 2 (25 1 N. M.) Villa Grove.
- * Wray (N. M.) 65 4 Plattsmouth, Neb.

CONNECTICUT.

| | | |
|-------------------|----------------|----------------|
| 25 Goahan, W'dham | 37 Sandy Hook. | 29 South Lyme. |
| Os | 37 Southford. | 37 Stepney. |
| 25 Hop River. | 37 Southbury. | 25 Thompson. |
| 25 No. Windham. | | |

- * Black Rock 15 0 telephone, Bridgeport.
- * Bridgewater, 20 0 by telephone, New Milford.
- * Buckland 15 0 telephone, Hartford.

- * Burnside 15 0 telephone, Hartford.
- * E. Meriden 15 0 telephone, Meriden.
- * Greenfield Hill 15 0 telephone, Bridgeport.
- * Greenville 15 0 telephone, Norwich.
- * Griswold 15 0 telephone, Norwich.
- * Middlefield Centre, 15 0 telephone, Middletown.
- * Naubuc, 30 3 Hartford.
- * Noroton, 15 0 by telephone, Stamford.
- * Occum 15 0 telephone, Norwich.
- * Orange 15 0 telephone, New Haven.
- * Preston 15 0 telephone, Norwich.
- * Sherman, 20 0 telephone, New Milford.
- * So. Meriden 15 0 telephone, Meriden.
- * Taftville 15 0 telephone, Norwich.
- * Thamesville 15 0 telephone, Norwich.
- * Versailles 15 0 telephone, Norwich.
- * Voluntown 15 0 telephone, Norwich.
- * W. Hartford 15 0 telephone, Bridgeport.
- * W. Stratford 15 0 telephone, Hartford.
- * Warren, 20 0 by telephone, New Milford.
- * Whitneyville, 50 0 New Haven.
- * Winnipauk, 15 0 by telephone, Norwalk.

DAKOTA.

| | | |
|---------------------|----------------------|-----------------|
| 947 Antelope. | 908 Ellendale. | 898 Montrose. |
| 920 Ahol. | 897 Estelline. | 915 Mt. Vernon. |
| 890 Anthur. | 896 Everest. | 920 Northville. |
| 886 Big Stone City. | 890 Gardiner. | 915 Ordway. |
| 926 Broadland. | 947 Green River. | 901 Oriska. |
| 926 Crandon. | 909 Henry. | 908 Preston. |
| 940 Canning. | 890 Hillsboro. | 926 Pukwana. |
| 915 Chamberlain. | 896 Hitchcock. | 980 Rex. |
| 909 Clark Centre. | 947 Houston. | 924 Steele Sta. |
| 913 Cleveland. | 896 Kindred. | 924 Sterling. |
| 947 Dickinson. | 947 Little Missouri. | 933 Sweetbriar. |
| 983 Eagles Nest. | 895 Mayville. | 930 Wessington. |
| 913 Eldridge. | 918 Medina. | 926 Yorkt. wn. |
| | 926 Miller. | |

- * Crook City, 50 2 by telephone, Deadwood.
- * Colman, 55 4 La Crosse, Wis., or 25 3 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Dell Rapids, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Egan, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Fort Mission, 25 1 Webster.
- * Grandin Farm, free, telephone, Hillsboro.
- * Howard, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Madison, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
- * Pine Ridge Agency, 150 9 Cheyenne, Wyo.
- * Poplar River, 25 1 Bismarck.
- * Rosebud Agency, 175 10 Cheyenne, Wyo.
- * Spear Fish, 50 2 by telephone, Deadwood.
- * Sturgis City, 50 2 by telephone, Deadwood.
- * Wentworth, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.

DELAWARE.

| | | |
|-----------------|--------------|-----------------|
| 67 Bear. | 67 Hartley. | 60 Ross, Summer |
| 60 Broad Creek. | 67 Kiamensi. | office. |
| summer office. | 67 Porters. | 60 Woodside. |

FLORIDA.

- * Blackwater, 50 5 Pensacola.
- * Blue Pond, 75 5, (50 3 N. M. rate) Lake City
- * Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
- * Highland, 50 4 Lake City.
- * Kissimmee (N. M.) 150 10 Lake City.
- * Micanopy 75 5 (50 3 N. M. rate) Lake City.
- * Orange Lake 75 5 (50 3 N. M. rate) Lake City.
- * Paola, (N. M.) 100 6 Lake City.
- * Perry Junction, 75 5, (50 3 N. M. rate) Lake City.
- * Toool, (N. M.) 50 3 Lake City.
- * Waits Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

| | | |
|-----------------|--------------------|---------------------|
| 197 Chauney. | 176 Johnston. | 246 Roswell. |
| 248 Olmex. | 226 Lawrenceville. | 197 Surrency. |
| 407 Dubois. | 186 Midville. | 226 Suwanee. |
| 246 East Point. | 186 Perkins Junc. | 187 Victoria Mills. |
| 187 Folkston. | | |

- * Abbeville (N. M.) 40 3 Ft. Gaines.
- * Arlington, 40 3 Ft. Gaines.
- * Blakely, 40 3 Ft. Gaines.
- * Clakstown, 30 2 Cartersville.
- * Bookmart (N. M.) 25 2 Cartersville.
- * Senola, (N. M.), 25 2 Newnan.

IDAHO.

| | | |
|---------------|-------------------|-----------------|
| 578 Arimo. | 970 Hope Station. | 970 Sand Point. |
| 970 Dry Lake. | 970 Rathdrum. | |

ILLINOIS.

| | | |
|----------------------|-----------------------|----------------------|
| 316 Algonquin. | 307 Dumser. | 329 Olmstead. |
| 300 Allendale. | 346 Forreston Junc. | 358 Palmyra. |
| 307 Alpine. | 318 Gays. | 309 Palestine. |
| 336 Anwan. | 308 Goodwine. | 319 Parrish. |
| 299 Barton. | 317 Gravel Bank. | 319 Rhinard. |
| 328 Beecher City. | 314 Hazel Dell. | 316 Richmond. |
| Elmhurst Co. | 308 Henderson. | 329 Pomona. |
| 329 Belknap. | 317 Hills Park. | 309 St. Marie. |
| 337 Belknap. | 309 Hunt City. | 299 Sidell. |
| 298 Bonfield. | 399 Indianapolis. | 297 State Line, Lake |
| 299 Brocton. | 357 Knox Ok. Galva. | Co. |
| 336 Bureau, Ok. | 387 Larchland. | 318 Stockton. |
| Princeton. | 327 Lodge. | 346 Union Grove. |
| 316 Chumung. | 308 Lyford. | 348 Wann. |
| 308 Chems Park. | 307 Mannheim. | 307 Wayne. |
| 347 Oliver Ok. Cuba. | 309 Montrose, Effing- | 309 West Liberty. |
| 308 Claytonville. | ham Co. | 318 Westfield. |
| 336 County Line Ok. | 326 Nachusa. | 299 Wetzel. |
| Kewanee. | 307 New Lebanon. | 309 Wheeler. |
| 336 Duggan, Ok. Ke- | 307 North Evanston. | 368 Wrights, Ok. |
| waunee. | 347 Oakford. | Greenfield. |
| 368 Epperson, Ok. | 309 Oblong. | 387 Zanesville. |
| Bushnell. | | |

- * Albion, 25 2 Huntingburg, Ind.
- * Ansonia 25 2 Streator.

- * Belmont, 25 2 Huntingburg, Ind.
- * Big Rock 25 2 Aurora or Forreton.
- * Kernan 25 2 Streator.
- * Keenes 25 2 Huntingburg, Ind.

INDIANA.

| | | |
|----------------------|----------------------|--------------------|
| 252 Briant. | 300 Ingles. | 261 Oasian. |
| 271 Buena Vista. | 263 Letts Corner. | 290 Paxton. |
| 298 Cedar Lake, Sum- | 261 Liberty M. ls. | 298 Rose Lawn. |
| mer office. | 398 Lowell, Lake Co. | 253 Sardinia Crea- |
| 231 Centerton. | 241 Maples. | ing. |
| 300 Cynthiana. | 262 Maxwell. | 271 Sedalia. |
| 252 Daleville. | 262 Milroy. | 271 Sycamore. |
| 280 English Lake. | 260 Monon. | 800 Wadesville. |
| 299 Fountain, Vigo | 300 New Harmony. | 263 Westport. |
| Co. | 300 Owensville. | 242 West River Sum |
| 270 Grangers. | 381 New Ross. | mit. |
| | | 262 Warrington. |

- * Birdseye, 25 2 Huntingburg.
- * Boston 25 2 Huntingburg.
- * Burnville, 15 1, telephone Columbus.
- * Clifford, 15 1, telephone Columbus.
- * Crandall, 25 2 Huntingburg.
- * De Gonia 25 2 telephone, Evansville.
- * English 25 2, Huntingburg.
- * Enterprise 25 2 telephone, Evansville.
- * Eureka 25 2 telephone, Evansville.
- * Ferdinand, by mail, Ferdinand station.
- * Georgetown, Floyd Co. 25 2, Huntingburg.
- * Illiana, free, by telephone, Dana.
- * Lowell, Bartholomew Co. 15 1, telephone Columbus.
- * Lynville 25 2 telephone, Evansville.
- * Mouth Green River 25 2 telephone, Evansville.
- * Newburg 10 1 telephone, Evansville.
- * Milutown, 25 2 Huntingburg.
- * Oakland City, 25 2 Huntingburg.
- * Pleasantville 25 2 telephone, Evansville.
- * Pleasant 25 2 telephone, Evansville.
- * St. Louis Crossing 15 1, telephone Columbus.
- * St. Meinrad, by mail, Ferdinand station.
- * St. Wendel 15 1 telephone, Evansville.
- * Spottsville 15 1 telephone, Evansville.
- * Stendale 25 2 telephone, Evansville.
- * Warrenton 15 1 telephone, Evansville.
- * Wayne City, 25 2 Huntingburg.
- * Winslow, 25 2 Huntingburg.

INDIAN TERRITORY.

| | |
|--------------|----------------|
| 477 Chelsea. | 477 Claremore. |
|--------------|----------------|

IOWA.

| | | |
|-----------------------|----------------------|-----------------------|
| 463 Alton. | 416 Harcourt. | 416 Pilot Mound. |
| 426 Angus. | 444 Havelock. | 417 Polo. |
| 887 Ashton. | 435 Henderson, Ok. | 463 Ramsen. |
| 416 Ashurst. | Hastings. | 416 Benwick. |
| 426 Bancroft. | 426 Herndon. | 346 Riggs, Ok. Pres- |
| 417 Bethany Junc. | 426 Irvington. | ton. |
| Ok. Lamoni. | 386 Jackson Junc. | 416 Boland. |
| 425 Boile. | Ok. Waucoma. | 426 Rabena. |
| 425 Bradgate. | 416 Kamsar. | 426 Rathand. |
| 416 Bromley. | 454 Irwin. | 473 Rair. |
| 346 Browns, Ok. Free- | 435 Kalo. | 367 Sand Spring, Ok. |
| ton. | 445 Kirkman. | Anamosa. |
| 367 Buffalo. | 388 La Orew. | 397 Selma. |
| 425 Burt. | 435 Lake City. | 444 Sioux Rapids. |
| 3-8 Charlestown. | 407 Laurel. | 455 Solomon. |
| 426 Olive. | 444 Laurens. | 876 Spirit Lake. |
| 426 Cooper. | 397 Libertyville. | 455 Stennett, Ok. Red |
| 425 Dakota City. | 435 Lohrville. | Oak. |
| 367 Donahue, Ok. | 387 Long Point. | 416 St. Anthony. |
| Dixon. | 416 McCallaburg. | 444 Sutherland. |
| 876 Estherville. | 444 Marathon. | 416 Thor. |
| 417 Exline. | 407 Minerva. | 416 Thrall. |
| 367 Fairport. | 387 Montpelier. | 407 Van Cleave. |
| 425 Farnhamville. | 455 North Boro. | 417 Van Wert. |
| 454 Fletcher. | 417 Numa. | 367 Viola, Ok. Stone |
| 416 Galt. | 455 Page Centre, Ok. | City. |
| 407 Girard. | Clairinda. | 396 Wabburg. |
| 454 Gray. | 463 Paulina. | 426 West Bend. |
| 425 Hardy. | 444 Peterson. | 426 Yale. |

KANSAS.

| | | |
|-----------------|---------------------|--------------------|
| 517 Alum Creek. | 507 Hasleton. | 475 North Topeka. |
| 456 Argentine. | 508 Horton. | Ok. Topeka. |
| 456 Baker. | 456 Huron. | 476 Piqua. |
| 456 Barclay. | 457 La Harpe. | 503 Strong City. |
| 457 Bronson. | 456 Lancaster. | 476 Toronto. |
| 521 Chase. | 475 Lanken. | 457 Uniontown. |
| 527 Cleveland. | 527 Lenora. | 518 Valley Center. |
| 517 Clifton. | 507 Leonard. | 475 Wakarusa. |
| 527 Collier. | 446 Le Loap. | 447 Waseca Junc. |
| 503 Crawford. | 507 Miltonvale. | 456 Westphalia. |
| 523 Dorrance. | 457 Moran. | 465 Willis. |
| 527 Edmond. | 448 Mulberry Grove. | 476 Yates Center. |
| 456 Everest. | 456 North Lawrence. | |
| 514 Galva. | Ok. Lawrence. | |

- * Cottonwood Falls, 50 0 Strong City.
- * Enterprise, 10 0, by telephone, Detroit.

KENTUCKY.

| | | |
|--------------------|-----------------------|-------------------|
| 263 Bloomfield. | 263 Finchville. | 263 Taylorsville. |
| 291 Central City. | 263 Glencoe. | 339 Wickliffe. |
| 263 Crescent Hill. | 243 Pine Hill. | 320 Wings. |
| 243 Donerail. | 243 Rocky Hill. | |
| 233 Earlinger. | 263 South Louisville. | |

* Clay Lick, 25 1 by telephone, Worthville.

* Caseyville, by telephone, 25 2 Mt. Vernon, Ind., or 35 3 Henderson, Ky.

* Commercial Point, by telephone, 25 2 Mt. Vernon, Ind., or 35 3 Henderson, Ky.

* Combs Ferry, 25 2 Lexington, Ky., or 45 3 Hunting-

ton, W. Va.

* Corydon 10 1 telephone, Henderson.

* De Koven, by telephone, 25 2 Mt. Vernon, Ind., or 35 3 Henderson, Ky.

* Eastern Junc., 50 3 Lexington, Ky., or 35 2 Hunting-

ton, W. Va.

* East Ky. Junc., 35 2 Huntington, W. Va.

* Flemingsburg, 15 2 by telephone, Johnson Junc.

* Gistville, 25 1 by telephone, Worthville.

* Gratz, 25 1 by telephone, Worthville.

- * Gum Grove, by telephone, 25 2 Mt. Vernon, Ind., or 35 3 Henderson, Ky.
- * Kilgore, 80 2 Huntington, W. Va.
- * Lookport, 25 1 by telephone, Worthville.
- * Marion, 15 1 by telephone, Worthville.
- * Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
- * Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. Va.
- * Peach Orchard, 25 2 Catlettsburg.
- * Pine Grove, 50 3 Huntington, W. Va.
- * Port Biffe, 25 1 by telephone, Worthville.
- * Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
- * Rockville, 25 2 Catlettsburg.
- * Springport, 20 1 by telephone, Worthville.
- * Waverly, by telephone, 20 2 Mt. Vernon, Ind., or 25 2 Henderson, Ky.
- * Weston, by telephone, 30 3 Mt. Vernon, Ind., or 40 4 Henderson.

LOUISIANA.

- | | | |
|------------------|--------------------|---------------------|
| 404 Atchafalaya. | 395 Grosse Tete. | 433 Prudhomme. |
| 395 Baton Rouge. | 354 Lookout. | 433 Robeline. |
| 424 Boyce. | 424 Leocompte. | 442 San Patrice. |
| 433 Derbonne. | 395 Maringuin. | 433 Sinoott. |
| 424 Bois. | 434 Mermontean. | 442 Stonewall. |
| 424 Garland. | 433 Moreland. | 393 Vacherie. |
| 424 Gloster. | 395 Plaquemine. | 395 W. Baton Rouge. |
| 375 Gouldsboro. | 442 Pleasant Hill. | 424 Whitesville. |
| 442 Grand Cane. | 433 Provencal. | |
- * Fodochs, 50 3 (30 2 N. M. rate), New Orleans.
 - * Milliken Bend (N.M.) 40 8 La Tulah.
 - * St. James, 50 3 (30 2 N. M. rate), New Orleans.

MAINE.

- * Presque Isle. 16 Lake Maranacook 20 Paris Hill. Ck. Winthrop.
- * Baring 15 1 telephone, Calais.
- * La Grange, 25 2 Bangor.
- * Kennebunkport 25 0 stage, Kennebunk.
- * Poland Spring, Summer Office, 20 1 Lewiston.
- * Ocean Bluffs 50 0 stage, Kennebunk.
- * Princeton 25 2 telephone, Calais.
- * Red Beach, 15 1 telephone, Calais.
- * Robinson, 20 1 telephone, Calais.
- * Sebec, 25 2 Bangor.
- * So. La Grange 25 2 Bangor.

MANITOBA.

- | | | |
|---------------|-------------------------|--------------------|
| Alexandria. | Fourth Siding. | Rapid City. |
| Anstin. | Flat Creek. | Reaburn. |
| Brandon. | Gladstone. | Rosser. |
| Broadview. | High Bl. ff. | sewoll. |
| Burnside. | McGregor. | St. Boniface Junc. |
| Chater. | Minnedosa. | Sidney. |
| Dewinton. | Nepawa. | Third Siding. |
| Du Frost. | Oswawa. | Westbourne. |
| Emerson Sta. | Portage La Prairie Sta. | West Lynne. |
| End of Track. | | |

The above named offices in Manitoba (except Portage La Prairie, Reaburn, Rosser, St. Boniface Junc. and West Lynne) should be checked direct at the rate of 25 and 2 more than the Manitoba State rate, those excepted, should be checked direct at the Manitoba State rate.

MARYLAND.

- | | | |
|--------------------------|----------------------|--------------------|
| 85 Ashland. | 60 Fruitland. | 54 Peninsula Junc. |
| 67 Black, summer office. | 85 Lutherville. | 54 Pocomoke Sta. |
| 77 Bowie. | 77 Marlboro. | tion Ck. Poko. |
| 67 Centerville. | 67 Millington. | moke City. |
| 67 Churchville. | 67 Octoraro Ck. Row. | 67 Prices. |
| 67 Edgewood. | 85 Odenton. | 67 Sudlersville. |
- * Gaithersburg, 25 2 Baltimore.
 - * Hyattsville, 25 2 Baltimore, Md., or Washington, D. C.
- Charge for three extra words in messages to Gaithersburg and Hyattsville, and accept only prepaid day messages.

MASSACHUSETTS.

- | | | |
|---------------|---------------------|---------------|
| 26 Conway. | 21 Wellesley Hills. | 21 Tyngsboro. |
| 23 New Salem. | 12 W. Harwich, Ck. | 25 W. Medway. |
| 25 Oxford. | | |
- Dennisport.
- * Asylum Sta., 75 0 Danvers.
 - * Bass River Harbor, free by telephone, So. Dennis.
 - * Beach Bluff.
 - * Clifton House 75 0 Swampscott.
 - * Hotel Preston 50 0 Swampscott.
 - * Peabody Camp 100 0 Swampscott.

- * Burlington 150 0 Woburn.
- * Ochoaset, 25 0 by telephone, East Bridgewater.
- * Collins' Mills, Dracut, 15 1 by telephone, Lowell.
- * Cummingsville, 50 0 Woburn.
- * Danvers Centre, 25 0 Danvers.
- * Danvers Insane Hospital, free by telephone, Salem.
- * Danversport, 25 0 Danvers.
- * Dracut Navy Yard, 15 1 by telephone, Lowell.
- * Forge Village, 15 1 by telephone, Lowell.
- * Gardner, 15 0 Gardner Depot.
- * Grantville, 15 1 by telephone, Lowell.
- * Holbrook, free, Braintree.
- * Hyannisport, 15 0 by telephone Hyannis.
- * Longmeadow 150 0 E. Longmeadow.
- * Lunenburg, 10 0 by telephone, Fitchburg.
- * Matfield, 50 0 East Bridgewater.
- * Meirose Highlands, 25 0 Meirose.
- * Middlesex Village, 15 1 by telephone, Lowell.
- * No. Middleboro, 150 0 Middleboro.
- * No. Woburn 75 0 Woburn.
- * Phenix Village, Tewksbury, 15 1 by telephone, Lowell.
- * Point of Pines Revere Beach 25 0 telephone, Chelsea.
- * Rock, 150 0 Middleboro.
- * South Billerica, 15 1 by telephone, Lowell.
- * So. Gardner, 15 0 Gardner Depot.
- * South Mills, 10 0 by telephone, New Bedford.
- * Weentham, 35 0 by telephone, Providence, R. I.
- * West Bridgewater, 15 0 by telephone, East Bridgewater.
- * W. Chelmsford, 15 1 by telephone, Lowell.
- * W. Danvers, 150 0 Danvers.
- * Westford, 25 0 Westford Depot.
- * Westford Depot, 15 1 by telephone, Lowell.

- * West Gardner, 15 0 Gardner Depot.
- * Woburn Highlands, 25 0 Woburn.

MEXICO.

- * Gallego, 58 6 El Paso, Tex.
- * La Jarita, 25 2 Laredo, Texas.
- * Laguna, 66 7 El Paso, Tex.
- * Montezuma, 52 5 El Paso, Tex.
- * Paso del Norte, 25 2 El Paso, Tex.
- * Parral de Hidalgo, 450 43 Galveston, Tex.
- * Rodriguez, 25 2 Laredo, Texas.
- * Samalayuca, 40 4 El Paso, Tex.
- * San Jose, 43 4 El Paso, Tex.

MICHIGAN.

- | | | |
|---------------------|----------------------|-----------------------|
| 127 Alanson. | 127 Freedom. | 883 Narenta. (North.) |
| 127 Bay View. | 119 Free Soil. | 281 North Fayette. |
| 138 Beaver Lake. | 230 Garfield. | 281 North Morenci. |
| 220 Beech. | 127 Hobart. | 250 Orleans. |
| 269 Bowens. | 127 Indian River. | 274 Penn. |
| 281 Bridge water. | 836 Iron River Junc. | 838 Powers. (north) |
| 211 Britton. | (North.) | Ck. Spalding. |
| 210 Broadway Centre | 231 Jerome. | 260 Ransom. |
| 210 Brown City. | 230 Kawkawlin. | 200 Sanborne. |
| 240 Collins. | 119 Manistee Junc. | 260 Shelbyville. |
| 250 Crapo. | 210 Marlette. | 220 Swartz Creek. |
| 836 Crystal Falls | 210 Marquette. | 127 Topinabee. |
| (north.) | 49 Metropolitan | 127 Vanderbilt. |
| 269 Diamond Lake | (North.) | 269 Walkup Ck. |
| Ck. White | 137 Milton Junc. | White Cloud. |
| Cloud. | 260 Moline. | 100 Wetsell. |
| 210 Fostoria. | 127 Mullet Lake. | 127 Wolverine.. |
- * Au Train, 40 3 Marquette.
 - * Flushing, 15 0 by telephone, Flint.
 - * Lee-ville 15 0 telephone, Detroit.
 - * Munising, 40 3 (30 2 N. rate), Marquette.
 - * Newberry, 40 3 (30 2 N. rate), Marquette.
 - * Paines, 40 3 (30 2 N. rate), Marquette.
 - * Roseville 15 0 telephone, Detroit.
 - * St. Ignace, 40 3 (30 2 N. rate), Marquette.
 - * Sand River, 40 3 Marquette.
 - * Seney, 40 3 (30 2 N. rate), Marquette.

MINNESOTA.

- | | | |
|-------------------|--------------------------|---------------------|
| 190 Argyle. | 874 Heming. | mer Office. |
| 865 Arlington. | 883 Humboldt. | 870 Oshawa. |
| 885 Battle Lake. | 889 Kennedy. | 885 Parkdale. |
| 875 Buffalo Lake. | 884 Kitson. | 885 Pelican Rapids. |
| 885 Clitheral. | 861 Lakeland. | 865 S. Albans. |
| 865 Cologne. | 861 Minnehaha. | 892 Slayton. |
| 874 Deer Creek. | Minnesota Trans-fer Sta. | 860 Sturgeon Lake. |
| 885 Elizabeth. | 890 Mankota. | 876 Vernon Centre. |
| 880 Garfield. | 883 Northcote. | 865 Waconia. |
| 865 Gaylord. | 865 Northome. | 865 Winthrop. |
| 875 Green Isle. | | |
- * Currie, 25 2 Tracy.
 - * Deforest, 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis., or 35 2 Sioux Falls, Dak.
 - * Prairie Junc., 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis., or 35 2 Sioux Falls, Dak.

MISSISSIPPI.

- | | |
|----------------|-------------|
| 363 Armistead. | 363 Morton. |
|----------------|-------------|
- * Arcola, 85 6 Vicksburg.
 - * Johnsonville, 85 6 Vicksburg.
 - * Overley, 85 6 Vicksburg.
 - * Shipland, 50 3 Vicksburg.
 - * Stoneville, 85 6 Vicksburg.

MISSOURI.

- | | | |
|------------------------|-------------------------|----------------------|
| 399 Aurora, Miller Co. | 427 Gault. | 359 Montezano Spgs. |
| 446 Calla. | 369 Gilmore. | 428 Montserrat. |
| 410 Cedar Gap. | 360 Grays Ridge. | 437 Napoleon. |
| 398 Clark. | 388 Granger. | 369 Richfield, Ok. |
| 399 Creve Coeur Lake. | 370 Hogan. | Old Monroe. |
| 399 Eldon. | 369 La Jeda, St. Louis. | 399 Russellville. |
| 467 Elina. | Co. | 410 Seymour. |
| 969 Etiah. | 437 Lake City. | 398 Shelbyville. Ok. |
| 429 Fordland. | 349 Lakeville. | Shelbina. |
| 418 Fountain Grove. | 398 McMillin. | 359 Vineland. |
| 370 Gads Hill. | 370 Middlebrook. | |
- * Ashley, 10 0, by telephone, Bowling Green.
 - * Augusta, By mail, Labadie.
 - * Bonne Terre 15 2 Summit Sta.
 - * Greenfield, 50 0 So. Greenfield.
 - * Lemons 25 2 Unionville.
 - * Malden 25 2 Birds Point.
 - * Purdin, 25 2 Unionville.

MONTANA.

- | | | |
|---------------|--------------|----------------------|
| 957 Ainslie. | 956 Keith. | 971 Norxon. |
| 261 Billings. | 958 Martin. | 960 Riverside. |
| 970 Cabinet. | 959 Myers. | 971 Rock Island. |
| 958 Forsythe. | 583 Meirose. | 583 Silver Bow Junc. |
| 960 Custer. | 957 Milton. | 967 Terry. |
- * Ft. Maginnies 50 2 Bismarck, Dakota.
 - * Rocky Point 25 1 Bismarck, Dakota.
 - * Mardenville, mail Ft. Maginnies.
 - * Walkerville, 30 2 telephone Butte City.

NEBRASKA.

- | | | |
|------------------|------------------|--------------------|
| 474 Adams. | 474 Glen Rock. | 465 Stella. |
| 927 Ainsworth. | 464 House. | 474 Talmage. |
| 927 Atkinson. | 474 Howe. | 927 Stuart. |
| 474 Avoca. | 927 Inman. | 465 Verdon. |
| 474 Brook. | 22 Long Pine. | 478 Wakefield. |
| 538 Chapell. | 506 Malcolm. | 473 Wayne. |
| 922 Clear Water. | 474 Sheridan. | 474 Weeping Water. |
| 464 Gilmore. | 464 Springfield. | |
- * Auburn (N. M.) 25 2 Nemaha City.
 - * Benktman, (N. M.) 50 4 Plattsmouth.
 - * Burchard, (N. M.) 35 2 Plattsmouth.
 - * Franklin (N. M.) 45 3 Plattsmouth.
 - * Haigler, (N. M.) 60 4 Plattsmouth.
 - * Liberty, (N. M.) 35 2 Plattsmouth.
 - * McCook (N. M.) 55 4 Plattsmouth.
 - * Putnam (N. M.) 35 2 Plattsmouth.
 - * Stratton (N. M.) 55 4 Plattsmouth.

NEVADA.

- | | | |
|---------------|-------------------|-------------|
| 677 Junction. | 677 Rhodes. | 677 Summit. |
| 676 Luning. | 676 Soda Springs. | |

NEW BRUNSWICK.

- | | | |
|---------------------|---------------|--------------|
| 3 Albert. | 3 Lake Ha Ha. | 3 St. Louis. |
| 3 Carleton Sta. | 3 Passaicag. | |
| 3 Fort Elgin, 25 2. | 3 Backville. | |

NEW HAMPSHIRE.

- | | | |
|------------------------------|----------------|---------------|
| 20 Intervale, summer office. | 31 E. Lebanon. | 20 Livermore. |
|------------------------------|----------------|---------------|
- * Bedford 25 2 telephone, Manchester.
 - * Chesterfield, 25 0 by telephone, Brattleboro, Vt.
 - * Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
 - * Concord State Prison, 10 0 by telephone, Concord.
 - * North Hinsdale, 20 0 by telephone, Brattleboro, Vt.
 - * W. Concord, 15 1 telephone, Concord.

NEW JERSEY.

- | | | |
|-----------------------------|----------------------------|----------------------------------|
| 47 Bay Head. | 41 Franklin (Essex Mills). | 52 Nolans Point, Lake Hopatcong. |
| 53 Blairtown. | 47 Forked River Sta. | 41 Oradell. |
| 41 Brick Church. | 53 Franklinville. | 52 Valley. |
| Tariff same as Orange. | Summer office | 47 Waretown. Ok. |
| 53 Cedar Brook. | 47 Hartford. | Forked River. Sta. |
| 47 Centerville, Passaic Co. | 47 Kingston. | 41 Wayne. |
| 47 Chadwicks. | Trenton. | 41 West Orange. |
| 47 Clementon. | 47 Magnolia. | 52 Vienna. |
| 52 Finderne, Somerville. | 53 Malaga, Summer | |
- * Barnegat City 25 1 Philadelphia, Pa.
 - * Crosswicks 15 1 telephone, Trenton.
 - * Little Egg Harbor 25 1, Philadelphia, Pa.
 - * Yardville 15 1 telephone, Trenton.

NEW MEXICO.

- | | | |
|-----------------------------------|------------------|-------------------|
| 528 Aden. | 638 Gage. | 632 Monero. |
| 559 Blossburg. | 637 Gallup. | 630 San Antonio. |
| 566 Cerrillos. | 560 Hot Springs. | 638 Separ. |
| 637 Coolidge. | 633 Lava. | 639 Stein's Pass. |
| 559 Dillon. | 626 La Joya. | 636 Upham. |
| 633 Florida. | 559 Lynn, Ok. | |
| 828 Fort Selden, Ok. | Las Cruces. | |
| * Fort Stanton, 25 3 San Marcial. | | |
| * Fort Union, 25 2, Watrous. | | |
| * Ojo Caliente, 50 0 Barranca. | | |

NEW YORK.]

- | | | |
|---|-------------------------------------|-----------------------------|
| 64 Abion Station, Oswego Co. Ok. | 83 Glen Mountain House, Tariff | 83 North Lansing. |
| 65 Apalachin. | same as Wat-kins, Ok. Wat-kins. | 83 Bonkonkoma. |
| 83 Broad Channel. | 101 Halbert. | 73 Round Island. |
| Rockaway Beach. | 101 Hartdale. | 64 Sanford Corners. |
| Summer office, Ck. B. Beach. | 40 Hartsdale. | 74 Scriba. |
| 83 Brown's Sta. Yates Co. summer office | 58 Jeffersonville. | 46 Sterlington. |
| 111 Ceres. | 44 Lake Placid, St. Lawrence House. | 37 Stormville. |
| 139 Ch'auqua, Summer Office. | 101 Lakeville, Summer Office. | 41 Tarrytown Sta. |
| 101 Cohocton. | 111 Little Genesee. | 73 Thousand Island. |
| 46 Cornwall on Hudson. | 46 Livingston Manor. | 44 Tremblays Iron Works. |
| 38 E. Rockaway summer office. | 83 Lowmanville. | 65 Vestal. |
| 74 Fish Creek. | 64 Mannsville. | 46 Wallkill. |
| 51 Fish's Eddy, Delaware Co. | 74 McConnellsville. | 111 Westons, Cattaungus Co. |
| 44 Franklin Falls. | 44 Millers Saranac Lake House. | 37 West Patterson. |
| 83 Great Neck, L. I. | 46 Milton. | 74 West Vienna. |
| 83 Greenlawn. | 83 Nichols. | 146 Wicopee Junc. |
| | 41 North Tarrytown. | 111 Wigwam. |

- * Allens Hill, 20 0 telephone, Canandaigua.
- * Ava, 20 0 telephone, Rome.
- * Bath-on-the-Hudson, 25 0 Albany.
- * Bistol, 15 0 telephone, Canandaigua.
- * Brushland, 25 2, Delhi.
- * Delta, 10 0 telephone, Rome.
- * Four Corners S. I., 30 0 W. New Brighton.
- * Ghent 15 1 telephone, Chatham.
- * Goffs Mill 10 1 telephone, Bath, S. Co.
- * Honeoye, 25 0 telephone, Canandaigua.
- * Howard 10 1 telephone, Bath, S. Co.
- * Kenwood, 25 0 Albany.
- * Lee Centre, 10 0 telephone, Rome.
- * Linoleumville, S. I., 100 0 W. New Brighton.
- * Minisink, Orange Co., 15 1 Port Jervis.
- * Point Rock, 15 0 telephone, Rome.
- * Stockton 10 1, Cassadaga.
- * Stokes, 10 0 telephone, Rome.
- * Taberg, 15 0 telephone, Rome.
- * Vernon, 10 0 by telephone, Oneida.
- * W. Branch, 15 0 telephone, Rome.
- * Whitestown, 75 0 Ulia.

NORTH CAROLINA.

- | | | |
|------------------|----------------|-------------------|
| 205 Alexanders. | 134 Jamestown. | 144 Bowman M. |
| 115 Chapel Hill. | 154 Linwood. | 194 Warm Springs. |
| 125 Laurel Hill. | 173 Newton. | 98 Whiteville. |
- * Falkland, 25 2 (25 1 N. M. rate), Tarboro.
 - * Nags Head 25 1 Norfolk, Va.
 - * Pactiva, 40 3 (30 2 N. M. rate), Tarboro.

NORTH WEST TERRITORY.]

- * Battleford, mail, Winnipeg, Man.
- * Edmonton, mail, Winnipeg, Man.
- * Humboldt, mail, Winnipeg, Man.
- * Swan River, mail, Winnipeg, Man.

NOVA SCOTIA:

- | | | |
|-----------------|---------------|----------------|
| 3 Albion Mines. | 2 Sherbrooke. | 2 White Haven. |
|-----------------|---------------|----------------|
- * Aspe Bay 25 2, No. Sydney.
 - * Beaver River 15 1 telephone, Yarmouth.
 - * Baddeck, 25 2 North Sydney.
 - * Englishtown 25 2, No. Sydney.
 - * Green Cove 15 1 telephone, Yarmouth.
 - * Ingolish, 25 2 North Sydney.
 - * Maitland, Yarmouth Co. 15 1 telephone, Yarmouth.
 - * Tusket, 15 1 telephone, Yarmouth.
 - * Tusket Wedge, 15 1 telephone, Yarmouth.

OHIO.
 221 Alvada. 202 Hadley Junction. 222 New Carlisle.
 231 Alvordston. 201 Hartland Centre. 213 Newport.
 211 Balloys. 242 Hollandburg. 159 North Benton.
 170 Bartow. 211 Ironville. 242 Osgood Sta.
 170 Bolivar. 170 Jewett. 192 Point Pleasant.
 201 Brighton. 191 Lakeville. Gallia Co.
 151 Brilliant. 243 Laura. 252 St. Johns.
 218 Buena Vista. 180 Lodi. 180 Spencer, Medina
 201 Clarksville. 202 Longstreth Co.
 180 Creston. 221 Luckey. 212 Toledo.
 180 Dalton. 242 Ludlow Falls. 232 Venedocia.
 232 Enterprise. 221 McComb. 211 Wardens.
 180 Everett, Summit. 221 McClure. 213 Wheelersburg.
 Co. 232 Mercer. 180 West View.
 180 Fair Grounds. 222 Milledgeville. 232 Westville.
 222 Freeport, Warren. 180 New Berlin, Stark. 170 Zoar.
 Co. Co.

180 Geauga Lake.
 * Amboy 10 1 No. Kingsville.
 * Anderson station, 10 0 by telephone, Chillicothe.
 * Andersonville, 10 0 by telephone, Chillicothe.
 * Biers Run, 10 0 by telephone, Chillicothe.
 * Brownstown, 10 0 by telephone, Chillicothe.
 * Catawba Island, Ottawa Co. 25 2 Sandusky.
 * Clarksville, 10 0 by telephone, Chillicothe.
 * Conneaut Harbor 25 2, No. Kingsville.
 * Conneaut Lake 10 1, No. Kingsville.
 * Da. byville, 10 0 by telephone, Circleville.
 * De Kalb, 25 2 Mansfield.
 * East Orwell, (N. M.) 25 2 Ashtabula.
 * Five Points 10 0 by telephone, Circleville.
 * Greenland, 10 0 by telephone, Chillicothe.
 * Haysville, Pickaway Co., 10 0 by telephone, Circleville.
 * Hartsville, 15 1 Minerva.
 * Haysville, Ashland Co., 15 1 by telephone, Ashland.
 * Jeromeville, 15 1 by telephone, Ashland.
 * Kinnickinnick, 10 0 by telephone, Chillicothe.
 * Middle Branch, 15 1 Minerva.
 * Mogadore, 15 1 Minerva.
 * Monitor 25 2 telephone, Ironton.
 * Monroe Centre, 20 2 No. Kingsville.
 * New Hazelton, 15 1 Minerva.
 * New Richland 25 2 telephone, Ironton.
 * No. Baltimore, 25 2 Defiance or Tiffin.
 * Oakwood, 25 2 Fostoria, O., or Ft. Wayne, Ind.
 * Osnaburg, 15 1 Minerva.
 * Pierpont, 25 2 No. Kingsville.
 * Poland, free by telephone, Youngstown.
 * Racine 20 1 telephone, Pomeroy.
 * Red Lion, 15 1 by telephone, Franklin.
 * Rimer 25 2 Delphos.
 * Robertsville, 15 1 Minerva.
 * Rutland 20 1 telephone, Pomeroy.
 * Sherradsville, 15 1 Minerva.
 * So. Elmwood, 10 0 by telephone, Circleville.
 * Syracuse 20 1 telephone, Pomeroy.
 * Texas Hollow 25 2 telephone, Ironton.
 * Veuvius Sta. 25 2 telephone, Ironton.
 * Yellow Bud, 10 0 by telephone, Chillicothe.

ONTARIO.
 Alfred. Elwood. Manilla.
 Alma Sta. Ethel sta. Milford.
 Almonte Sta. Fiesherston Sta. New Castle Sta.
 Amable du Fond. Garden Island. Pickering.
 Balsantynes Sta. Ok. Kingston. Benton.
 Beeton. Georgetown Jc. Riverside.
 Belgrave. Glenhuron. Stamford.
 Brechin Sta. Hagersville Sta. Stormness.
 Burford Sta. Head Lock, new Summerside.
 Caladonia Spgs. Canal, near Treadwell.
 Campbellville. Thorold. Uthoff.
 Carleton Place. Inwood. Waldemar.
 Chalk River. Iroquois. Wendgo.
 Darlington. La Salette. Williamsford Sta.
 Dublin Sta. Lavant.

OREGON.
 803 Beaverton. 804 Goshen. Redfield.
 785 Bonneville. 803 Hillsboro.
 * Airtie (N. M.) 50 3 Portland.
 * Blue Mountain, 50 5 by telephone, Walla Walla, W. T.
 * Coburg 50 3 Portland.
 * Fort Alamath, 50 3 Ashland.
 * West Solo 50 3 Portland.

PENNSYLVANIA.
 84 Antes Fort. 131 Jane Bug. 159 Slippery Rock.
 59 Ardmore. 93 Landrus. 59 Sixteenth St. Sta.
 140 Arthurs. 76 Leaman Place. Ck. Philadel-
 140 Bald Ridge. 94 Lewistown June. phia.
 59 Berwyn. 59 Logan, Phila. Co. 84 Snyderstown.
 59 Brandywine. Ck. Wayne June. 111 Songbird.
 Summit. 140 Lucinda Station. 140 S. & A. Junction.
 130 Clarendon Depot 59 Lukens, Ck. Nor-
 riatown. 151 South Side. Pitt'
 Tariff same as riatown.
 140 Oalstown. 130 Marienville. burg. Tariff
 60 Conyngham. 122 Markleton. same as Pitts-
 140 Coasca. 84 Mainville. burg. Ok.
 52 Cresco, Monroe Co. 93 Morris, Tioga Pittsburg.
 Co. 131 Stonerville.
 58 Dunmore, Ok. 84 Mountain Grove. 140 Strattonville.
 140 Neshannock Falls. 130 Thompsons, War-
 Scranton. 59 Rahn's, Ok. Col- ren Co.
 59 East Greenville. legeville. 130 Tiona.
 122 Elk Lick. 66 Plymouth June. 66 Tripoli, Ok.
 151 Etna, Allegheny 59 Ridge Ave. Sta. Kempton.
 Co. Ck. Philadel-111 Turtle Point.
 140 Evansburg, But- phia. 150 Union City Depot
 ler Co. Ck. Plymouth, 151 Van Port.
 151 Fallston. 140 Rimersburg. 59 Virginsville, Ok.
 121 Fairmount City. 76 Richland, Ok. Moselem.
 130 Fairworth. Sheridan Lob-140 Volant.
 180 Garfield. anon Co. 150 Waterford Depot.
 59 Geigertown. 58 Rowland's. 130 Warren Depot.
 84 Georgetown. 140 Salina, Ck. Pe- 59 Wayne, Delaware
 Gibralter, Ck. troia. Co.
 Birdaboro. 94 St. Thomas. 84 W. Milton Co.
 66 Girard Manor. 111 Scabonda. Montgomery.
 Ck. Kingtown. 59 Shelly Tariff 151 Wildwood.
 59 Glen Moore same as Qua- 151 Wilkinsburg.
 59 Honey Brook. kerton, Ok. 75 Willowanna.
 66 Hunlock's. Quakertown. 151 Willow Grove.

94 Hunter's Run. 180 Sheffield Depot. Allegheny Co.
 140 Jackson Centre. 47 Schencks. Ok. 140 Wilmington.
 93 Jackson Summit Bristol. 140 Zellenople.
 * Academy Corners, 10 1 by telephone, Lawrenceville.
 * Alma House, 10 1 Allentown.
 * Balliettsville, 10 1 Allentown.
 * Best Sta., 10 1 Allentown.
 * Blooming Valley 10 1 telephone, Meadville.
 * Centre Point, 10 1 Allentown.
 * Centreville, Elk Co., free, by telephone, Scabonda.
 * Churchville Berks Co., 10 1 Allentown.
 * Claryn, 10 1 Allentown.
 * Corning, 10 1 Allentown.
 * Cowanesque Valley, 20 1 by telephone, Lawrenceville.
 * Dillingersville, 10 1 Allentown.
 * Elmer, 20 1 by telephone, Lawrenceville.
 * Eagleville, 10 1 Allentown.
 * Fairview, Montgomery Co., 10 1 Allentown.
 * Faglesville, 10 1 Allentown.
 * Franklin, Lehigh Co. 10 1 Allentown.
 * Gilbertsville, 10 1 Allentown.
 * Gays Mills 15 1 telephone, Meadville.
 * Hammondsburg 15 1 telephone, Meadville.
 * Harrison Valley, 20 1 by telephone, Lawrenceville.
 * Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.
 * Ironton, 10 1 Allentown.
 * Limerick Square, 10 1 Allentown.
 * Lower Milford, 10 1 Allentown.
 * Neffs, 10 1 Allentown.
 * Nelson, 10 1 by telephone, Lawrenceville.
 * New Berlin, 10 1 Allentown.
 * O. Island Beach 10 1 telephone, Meadville.
 * Overbrook, free by telephone, Merion Sta., Montg'y Co.
 * Pleasant Corner, 10 1 Allentown.
 * Red Hill, 10 1 Allentown.
 * Richsville, 10 1 Allentown.
 * Saegersville, 10 1 Allentown.
 * Schnecksville, 10 1 Allentown.
 * Slatedale, 10 1 Allentown.
 * Townville 15 1 telephone, Titusville.
 * Trappe, 10 1 Allentown.
 * Troy Centre 15 1 telephone, Titusville.
 * Unionville, Chester Co., 100 0 Kennett Square.
 * Wurttemberg, 25 0 Slippery Rock.
 * Yellow House, 10 1 Allentown.
 * Zionville Sta., 10 1 Allentown.

PRINCE EDWARD ISLAND.

* Bear River, 50 3 Sackville, N. B.
 * Bedford 50 3 Sackville, N. B.
 * Bloomfield, 50 3 Sackville, N. B.
 * Breadalban, 50 3 Sackville, N. B.
 * County Line, 50 3 Sackville, N. B.
 * Freetown, 50 3 Sackville, N. B.
 * Monell, 50 3 Sackville, N. B.
 * O'Leary, 50 3 Sackville, N. B.
 * Port Hill Sta., 50 3 Sackville, N. B.
 * Wellington, 50 3 Sackville, N. B.
 * York, 50 3 Sackville, N. B.

QUEBEC.

Beauce June. Lachute Mills. Six Portages.
 Bergeronnes. La Cruche. St. Alphonse de
 Berthierville. Lake Weedon. la Grande Bale.
 Boucherville Sta. Lake St. Joseph. St. Constant.
 Broughton. Longueuil Sta. St. Frederic de
 Bulwer. (M. S. R.) Beauce.
 Cacouna Sta. Louisville Sta. St. Gabriel.
 Cap St. Ignace. Mystic Sta. St. Genevieve de
 Sta. Notre Dame du Batiscan.
 Chelsea. Portage Sta. St. Jean Port Joli
 Chicoutimi. Point Claire Sta. Sta.
 Escumains. Port Seche. St. Martine.
 Etchemin Village. Port Neuf Light. St. Martin Sta.
 Eustia. House. St. Raymond.
 Farnham Sta. (C. Richby. St. Urbain.
 V. R.) River Quille Sta. Varannes Spgs.
 Grand Haie. Sault au Mouton. Wolfes Cove.
 Grand Piles. Sault au Recollet.
 Iberyville. Sta.

* Amherst Harbor, Magdalen Islands, 75 5 No. Sydney, N. S.
 * Anticosti Island 80 5 Gaspé, Que.
 * Etang du Nord, Magdalen Islands, 75 5 No. Sydney, N. S.
 * Grosse Isle, Magdalen Islands, 75 5 North Sydney, N. S.
 * House Harbor, Magdalen Islands, 75 5 No. Sydney, N. S.

RHODE ISLAND.

18 Riverside.
 * Barrington, 25 0 by telephone, Providence.
 * Onepatchet, 25 0 by telephone, Providence.
 * Hamilton, 25 0 by telephone, Providence.
 * Wrentham, 25 0 by telephone, Providence.

SOUTH CAROLINA.

153 Black's. 145 Lynchburg. 165 Ridgeland.
 146 Jacksonboro. 146 Ravenels. 174 Welford.

TENNESSEE.

292 Bellevue. 292 Madison. 292 Warner.
 292 Bon Aqua Sp'gs. 294 Petersburg. 292 White Bluffs.
 245 Courtville. 285 Sunbright. 315 Whitesburg.
 245 Lansing. 183 Union Depot. 240 Witha.
 284 Lewisburg.

* Rhea Springs, Summer office, 25 2 Spring City.
 * Homerville, 25 2 Moscow.
 * Obion, 25 2, Rives.

TEXAS.

500 Abbott. 460 Forest. 658 Sand Hills, (So.)
 553 Albany. 672 Haskell, (South). 674 Sanderson (So.)
 550 Aledo. 674 Haymond (So.) 830 San Elizario (So.)
 551 Alexander. 648 Hodge. 657 Sierra Blanca (So.)
 555 Antelope (South). 489 Hungerford. 658 San Martin (So.)
 559 Atascosa (South). 644 Latah (South). 603 Temple June.
 479 Bagwells. 603 Lorena. 490 Thorndale.
 657 Boracho (South). 470 Lodi. 603 Troy.
 670 Catulla (South). 675 Loxley (South). 670 Twobigh (So.)
 657 Carlos Pass (So). 674 Maxon Springs. 657 Van Horn, (South)
 470 Carroll Prairie. South. 672 Valentine (So.)
 485 Clear Creek. 764 Marathon (South). 470 Wayne.

495 Onaro (South). 655 Metz (South). 671 Webb (South).
 499 Davenport (So.). 673 Marks (South). 600 West.
 484 Dupree. 608 Mountain Home. 657 Wildhorse (South).
 670 Encinal (South). Bell Co. 483 Winona.
 603 Eddy. 659 Odessa (South). 489 Wharton.
 483 Edgewood. 656 Pearall (South). 830 Yalota (So)
 610 Farmer'sville. 655 Fyote (South).
 657 Finlay (South). 652 Putnam.
 * Aguilera, 50 3 Corpus Christi, or 30 2 Laredo.
 * Benavides, 40 3 Corpus Christi, or Laredo.
 * Bowie, 30 2 (25 1 N. M.) Fort Worth.
 * Calef, 25 2, (25 1 N. M.) Fort Worth.
 * D'hanis, 50 3 San Antonio.
 * Eagle Pass Junction, 100 7 San Antonio.
 * Henrietta, 25 1 Denison, Texas, or Dodge City, Ka. or 35 3
 (25 1 N. M.) Ft. Worth.
 * Hodge 25 2, (25 1 N. M.) Fort Worth.
 * Hondo City, 50 3 San Antonio.
 * Kaufman, mail, Dallas.
 * Kounts, 55 2 Beaumont.
 * Lacoste, 40 3 San Antonio.
 * Los Angeles, 50 3 Corpus Christi, or 30 2 Laredo
 * Pena, 40 3 Corpus Christi, or Laredo.
 * Realitos, 40 3 Corpus Christi.
 * Sabinal, 75 5 San Antonio.
 * Salado, 40 3, Austin.
 * San Diego, 40 3 Corpus Christi, or 50 3 Laredo.
 * Sunset 30 2 (25 1 N. M.) Ft. Worth.
 * Village, 40 3 Beaumont.

UTAH.

675 Hot Springs.
 * No Ogden 30 2 by telephone, Ogden.
 * Plain City, 50 3 by telephone, Ogden.

VERMONT.

38 Congress Hall Sheldon, 27 Passumpsic.
 Summer office. 31 Pompanoos.
 38 Maquam Bay. 89 South Wallingford.
 27 Miles Pond. Ok. St. Johnsbury.

* East Arlington, 10 1 Arlington.
 * E. Rupert, 15 2 Factory Point.
 * Grafton 15 1, Factory Point or Bellows Falls.
 * Guilford, 10 0 by telephone, Brattleboro.
 * Hartwellville, 20 1 by telephone, No. Adams, Mass.
 * Jacksonville, 25 2 by telephone, No. Adams, Mass.
 * Lowell Lake 15 1, Factory Point or Bellows Falls.
 * No Windham 15 1, Factory Point or Bellows Falls.
 * North Stamford, 15 1 by telephone, No. Adams, Mass.
 * Readsboro, 20 1 by telephone, No. Adams, Mass.
 * Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
 * Sadauga, 25 2 by telephone, No. Adams, Mass.
 * Stamford, 15 1 by telephone, No. Adams, Mass.
 * Wells, 15 2 Factory Point.
 * West Arlington, 15 1 Arlington.
 * West Dover, 25 0 by telephone, Brattleboro.
 * Wilmington, 20 0 by telephone, Brattleboro.
 * Windham 15 1, Factory Point or Bellows Falls.

VIRGINIA.

123 Afton. 114 Concord. 86 R. F. & P. June.
 114 Appomattox. 123 Greenville. 143 Riverdale.
 153 Backbone. 123 Lynchurst. 158 Roanoke.
 96 Bon Air, Chester-123 Milnes. 153 Troutville.
 field Co. 162 New River Depot. 123 Veevius.
 183 Bufords. 133 Lithia. 113 White Post.
 153 Clifton Forge. 96 Nettoway C. H. 96 Wilson's Depot.
 153 Cloverdale. 95 Plains.
 * Henrico, 25 2 Richmond.
 * Indian Rock (N. M.) 40 3 Richmond.
 * Lairds, (N. M.), 40 3 Richmond.
 * Lee Hall, 30 2 Richmond.
 * New Market, Nelson Co. (N. M.) 25 2 Richmond.
 * Salisbury, (N. M.), 40 3 Richmond.
 * Wilton (N. M.) 50 3 Richmond.
 * Yorktown, 45 3 Richmond.

WASHINGTON TERRITORY.

784 Carbonado. 727 Prescott. 774 Skagit City.
 978 Marshall. 729 Riparia. 783 Tuckey.

WEST VIRGINIA.

* Janelew, 50 4 Wheeling or Parkersburg.
 * Lost Creek, 50 4 Wheeling or Parkersburg.
 * Talcott, (N. M.) 25 2 Greenbrier, W. S. Spgs. or 50 3 Han-
 tington.
 * Weston, 50 4 Wheeling or Parkersburg.
 * Winifrede June, (N. M.) 30 2 Greenbrier, W. S. Spgs. or
 45 3 Huntington.

† Charge for three extra words in messages to these offices;
 and accept only prepaid day messages.

WISCONSIN.

837 Abrams. 826 Jefferson June. 847 Rudolph.
 846 Barneveld. 819 Kampeter. 845 Sauk City.
 837 Big Suamico. 826 Livingston. 806 Spring Meadow.
 855 Bloomer. 825 London. 837 Stiles.
 306 Calhoun. 826 Marshall. 826 Sullivan.
 855 Cheatek. 842 Meehan. 854 Superior.
 825 Cottage Grove. 845 Merritts Land'g. 852 Superior June.
 847 Curtiss. 839 Monico. 839 Summit Lake.
 306 Doussman. 806 No. Greenfield. 845 Twin Bluffs.
 840 Eden, Fond du 839 1/2 Union City. 850 Tunnel City.
 Lac. Co. 845 Prairie du Sac. 855 Turtle Lake.
 839 Elmhorst. 845 Richland City. 306 Wales.
 852 Hayward. Ok. Lone Rock.
 * Bailey's Harbor 25 1 Horn's Pier.
 * Cary, 25 2 Eau Claire.
 * Downsview, 25 2 Eau Claire.
 * Dunville, 25 2 Eau Claire.
 * Durand, 25 2 Eau Claire.
 * Jacksonport, 25 2 Horn's pier.
 * Lawrence, 25 2 Eau Claire.
 * Meridean, 25 2 Eau Claire.
 * Porterville, 25 2 Eau Claire.
 * Shawtown, 25 2 Eau Claire.
 * Sturgeon Bay Canal, 25 2 Horns Pier.
 * St. Josephs Pier, 25 2 Horns Pier.
 * Whitefish Bay, Door Co., 25 2 Horn's Pier.

WYOMING.

673 Fossil. Cokeville. 651 Harper.
 NORVIN GREEN, President.

TRANSFER SERVICE.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY,
New York, Sept. 16, 1882.

To all Transfer Agents and Offices:

On September 15th, 1882, El Paso, Texas, was added to the list of transfer offices in Class C, and assigned to L. C. Baker's district.

The transfer service has been discontinued at Cape May, Long Branch and Ocean Grove, N. J.

NORVIN GREEN,

President.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

The Second Annual Re-union of the Old Time Telegraphers' Association, postponed last year on account of the death of President Garfield, will take place at Niagara Falls, on Wednesday, September 20th, 1882.

President—O. H. Booth, Mansfield, O.

Vice President—Geo. W. Dugan, Jackson, Tenn.

Secretary—J. C. Mattoon, Baltimore, Md.

Treasurer—F. A. Armstrong, Cincinnati, O.

COMMITTEES.

Constitution and By-Laws.—W. R. Plum, Chicago
Col. R. C. Clowry, Chicago; E. P. Wright, Cleveland.

Arrangements for next Meeting.—J. W. Tillinghast, Buffalo; S. B. Gifford, Syracuse; E. P. Wright, Cleveland.

Superintendents of Telegraph, (Railroad or Commercial), Managers of Electric Light Companies, Telephone Exchanges, and Telegraph Offices, Railroad and Telegraph Purchasing Agents, Inventors and Patentees, Manufacturers, Dealers and supply Companies, Publishers, Patent Agents and Solicitors, Electricians, Engineers, Electrotypers, Electrical and Optical Instruments, Model and Pattern Makers, Metal Dealers, Photo-Lithographers, Wood Engravers and all others connected directly or indirectly in the trade or professionally with Electricity are specially requested to send their names and addresses immediately to the undersigned to be inserted free of charge in Berly's British Continental and American Electrical Directory, and Advertiser for 1883. Circular mailed free on application. Address all communications to George Comming, General Agent for Berly's Electrical Directory (Copyrighted,) 219 East 18th Street, New York City, U. S. A

THE firing at the bombardment of Alexandria was heard by telephone at Malta, through 1,000 miles of ocean cable. The experiments were suddenly terminated by the explosion of a shell from one of the 81-ton guns in the cellar of the Alexandria central office. A final whisper told this!

HEIGHT OF THE ATMOSPHERE.

DR. A. KERNER has estimated the height of the atmosphere from the phenomena of refraction. By two different methods he obtains heights of 189 and 192.6 kilometres (117.4 and 119.7 miles).—*Wied. Annal.*

[Some of the observations upon meteors and auroras have led to the conclusion that the atmosphere reaches a height of more than 500 miles. Laplace's limit of synchronous rotation would allow a possible height of more than 26,000 miles. The theory of Fresnel and Grove, that the luminiferous ether is only a very tenuous atmosphere, would make the portion which belongs to the earth of the same height as Laplace's limit.]

LIGHTNING RODS.

In a late number of the *Comptes Rendus*, M. Melens defends his system of lightning rods, which consists of a kind of cage formed of multiple conductors. He refers to an experiment which has been considered "capital" by many physicists, and which supports those of Faraday, proving that no electric manifestation is possible in a cage with continuous metallic sides, or metallic meshes placed in perfect communication with a common reservoir. Any animal is placed in a hollow sphere of metallic links placed upon or suspended from the coating of a strong Leyden battery. The attempt is then made to strike the animal by the discharge of the battery, but the animal experiences no injury from a spark which would be mortal were it not for the protective cage.

THE United States Senate passed, July 28, the joint resolution introduced by Mr. Flower, authorizing the President to invite delegates from all nations to meet with American delegates in Washington, for the purpose of fixing upon a meridian proper to be employed as a common zero of longitude and standard of time reckoning throughout the world.

THE *Scientific American* recommends that criminals in prison should be put to turning cranks which will operate dynamo-electric machines that may be employed to charge the so-called storage batteries.

THE *Scientific American* attributes the establishment of the first telegraph line in this country and on Long Island, N. Y., to Mr. Harrison A. Dryer.

DIVIDEND No. 61.

THE WESTERN UNION TELEGRAPH COMPANY,
New York, September 12, 1882.

THE Board of Directors have declared a quarterly dividend of one and one half per cent. upon the capital stock of this company, from the net earnings of the three months ending September 30th instant, payable at the office of the Treasurer on and after the 16th day of October next, to shareholders of record on the 20th of September instant.

The transfer books will be closed at 3 o'clock on the afternoon of September 29th instant, and opened on the morning of the 17th of October next.

R. H. ROCHESTER, Treasurer.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT 155—August 1, 1882.

BYRON A. SQUIRES.

ORRISTER S. DUNNELL.

BYRON A. SQUIRES died of Compound Fracture of Leg, producing Blood Poisoning, at Brooklyn, L. I., May 20, 1882. His certificate, No. 3670, was issued August 16, 1879.

The above claim will be paid from surplus.

ORRISTER S. DUNNELL died of Consumption, at Volga, Dak., May 14, 1882. His certificate, No. 3392, was issued Sept. 12, 1882.

One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4135.

Insurance expires Aug. 31, 1882; Members up Sept. 30, 1882. The number of members of the Association in good standing is: 1st Division, 2351; 2nd Division 137.

ASSESSMENT 156—September 1, 1882

JOSEPH E. BAILEY.

JAMES H. CROWLEY.

JOSEPH E. BAILEY died of Bilious Remitting Fever, at Frazerburg, Ohio, July 7, 1882. His certificate, No. 2983, was issued May 19, 1877.

The above claim will be paid from surplus.

JAMES H. CROWLEY died of Consumption, at Johnstown, N. Y., July 17, 1882. His Certificate No. 1055, was issued Jan. 2, 1871.

One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4194.

Insurance expires Oct. 1, 1882; Membership Oct. 31, 1882.

The number of members of the Association in good standing is: 1st Division, 2271; Second Division, 137.

BY-LAWS—SECTION VIII. "Upon the death of a member of the Association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and in case payment shall not be made within 30 days thereafter, the delinquent shall forfeit all claim to the benefits of the Association; and should payment not be made within 60 days, shall forfeit membership, to which said delinquent can only be restored as provided in Section VII. of these By-Laws."

A. R. BREWER,

Secretary,

P. O. Box. 3175

New York.

The Military Telegraph DURING OUR CIVIL WAR.

By WILLIAM R. PLUM, LL. B.

2 vols. Portraits and Illustrations. Price \$5.00

It is an interesting fact that a large proportion of the operators and other members of the corps were boys in their teens; and some of these lads distinguished themselves by the most adventurous and ingenious exploits, carrying the lines through a dangerous country, overcoming extraordinary obstacles, and risking capture or death. The record of the service performed by the telegraphers is arranged by military departments and interwoven with a narrative of the war, and some notable dispatches which passed over the military wires—many of them never before published—are given in the course of the story. The author has been fortunate in obtaining the personal reminiscences of a great many army operators, so that his book abounds with incidents of a variety of campaign life which has hitherto lacked a chronicler, and is not without details which have a value for the military historian. He tells of daring adventures, hair-breadth escapes, sufferings cheerfully borne, captivity, starvation and death in the line of duty, and he leaves us in no doubt that Secretary Stanton told only the truth when he said in an official report: "The Military Telegraph under the general direction of Colonel Stager and Major Eckert, has been of inestimable value to the service, and no corps has surpassed, few have equalled the telegraph operators in diligence and devotion to duty." The courage, energy and strict fidelity of the operators were commended in the warmest terms by the military commanders.—*The New York Daily Tribune.*

From the very nature of their occupation the telegraph operators who accompanied the army were constantly exposed to all kinds of adventure, and, while they took their share of danger bravely, they did not neglect any opportunity for fun that might arise. Hence the stories in these volumes are of all kinds—some sad, some merry, but all full of interest, and some containing a good deal of importance.

The general reader will find this a work of absorbing interest the historian will find it a valuable assistant in compiling the record of the war, and the Congressman will find it a sharp reminder that the men who shared the soldiers' perils, who suffered and bled and sometimes died with them, and who did so much to secure their victory for the Union, have never been remembered by the Pension Office which has done so much for the soldiers.—*The Philadelphia Inquirer.*

"The Military Telegraph During the Civil War of the United States," is in two large volumes of about 400 pages each. They contain portraits of General Stager, Andrew Carnegie and twelve gentlemen distinguished in war telegraphy. They have maps which show all the campaigns. The Confederate Telegraphic Cryptographic Key, the Confederate Mail Cryptographic Key and numerous illustrations are given. "Cipher Number Nine" is published complete. The history has been written to do justice to the members of the telegraph corps, who have not been awarded by government the honorable distinction that the reader will be convinced is their due. Too much value cannot be accorded a work of this character, which in addition to being an intelligent presentation of a subject that all ought to be familiar with illustrates good study, fidelity in research and in treatment to such an extent that it will take a high place in military history and be referred to again and again by military authorities. To one feature we would call especial attention. It is a concise history of the operations of the war with all details necessary to a full understanding of them. In this respect as well as on account of its tributes to telegraphy and to telegraph operators, high or low, it is worthy a place in every library. The author has contributed most important matter to American history in a book that its literature will treasure."

—*Boston Daily Globe.*

Address,

W. R. PLUM,

18 MARINE BUILDING.

CHICAGO, ILL.

A GREAT OFFER

To Superintendents, Managers, Purchasing Agents
and others having on hand

Worn Out, Damaged or Useless Morse Keys,

We will, until further notice, furnish our

New Steel Lever Keys

in exchange for all old keys for a cash difference of \$1.66 each. This price applies to any number of keys, no matter in what condition the old ones may be. They must be delivered to us, in packages plainly marked KEYS, with all charges PREPAID, and remittance should accompany the orders, except from Superintendents and Purchasing Agents of well-known Companies.

Now is the time, while the offer holds good, to get together all of your

Used-up and "Bad" Keys

and exchange them for splendid New Ones. See description and advertisement of Steel Lever Key. Send for circular.

J. H. BUNNELL & CO.,

112 Liberty Street, N. Y.

FREE !

Complete Instruction in Telegraphy

If you wish to know all about learning Telegraphy, constructing and operating Short Lines of Telegraph, &c., send your address, by postal card or letter, and get J. H. Bunnell & Co.'s Manual of Instruction for Learners of Telegraphy, latest edition, which we will send

FREE OF CHARGE,

to all who apply, by mail or otherwise.

It is the plainest and best book of instruction in Telegraphy ever published, being fully complete in description, explanation and illustrations.

J. H. Bunnell & Co.,

112 Liberty Street, N. Y.

THE AMERICAN BELL TELEPHONE COMPANY.

W. H. FORBES, *President*, W. K. DRIVER, *Treasurer*,
THEO. N. VAIL, *General Manager*.

This Company, owning the original patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company and the Harmonic Telegraph Company, the patents owned by these companies, is now prepared to furnish, upon application, either directly or through any of its agents, telephones of different styles, and applicable to a variety of uses. This Company desires to arrange with persons of responsibility for establishing

DISTRICT OR EXCHANGE SYSTEMS

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

It is also prepared to supply instruments for

PRIVATE LINE and CLUB LINE

systems for business or social uses; also telephones for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to the foregoing, and any further information relating thereto can be obtained from the Company at

No. 95 MILK STREET,
BOSTON, MASS.

All persons using telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

KERITE INSULATED

TELEGRAPH WIRES AND CABLES.

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession.

THE

DURABLE QUALITIES OF KERITE

RECOMMEND IT AS THE

CHEAPEST AND MOST ECONOMICAL
Insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation, furnished at short notice.

INSULATED WIRE

of all sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

For further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

B. HOTCHKISS, General Agent.

Another Great Reduction in Prices !

THE ORIGINAL

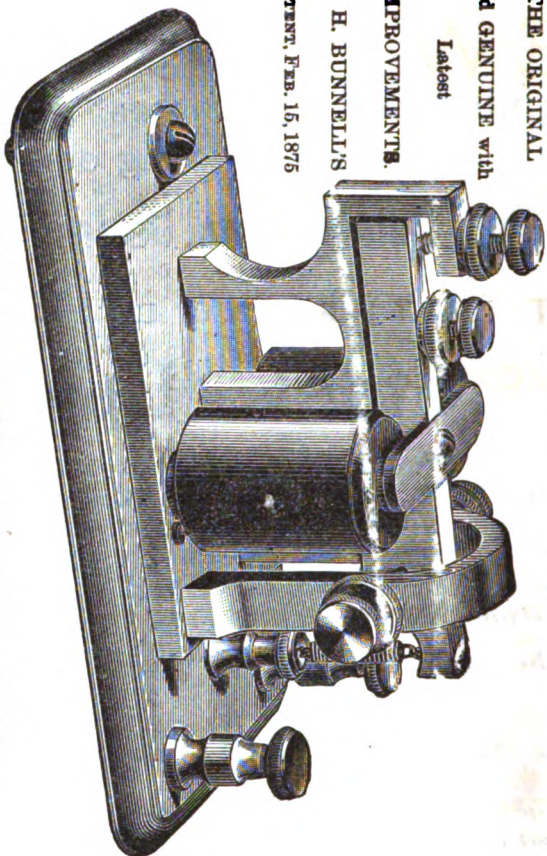
and GENUINE with

Latest

IMPROVEMENTS.

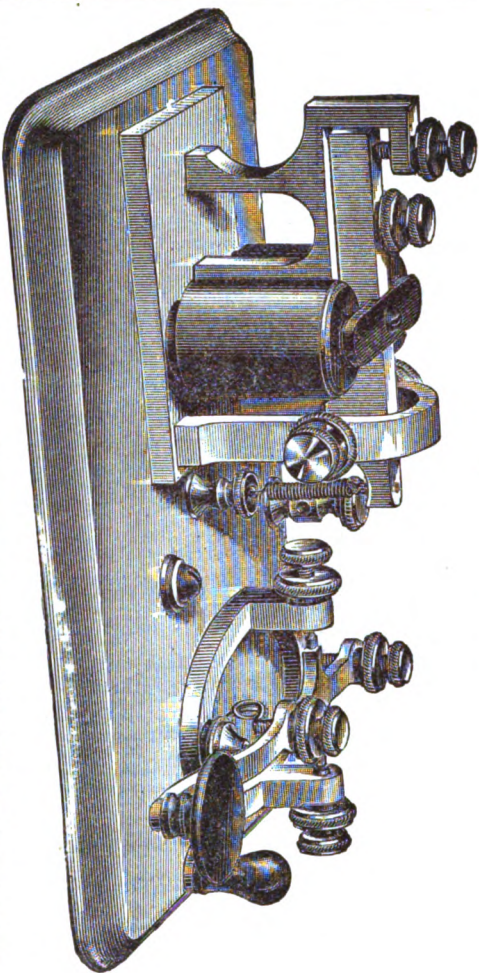
J. H. BUNNELLS

PATENT FEB. 16, 1876



THE GIANT SOUNDER—UNEQUALLED! \$4.00.

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$4.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



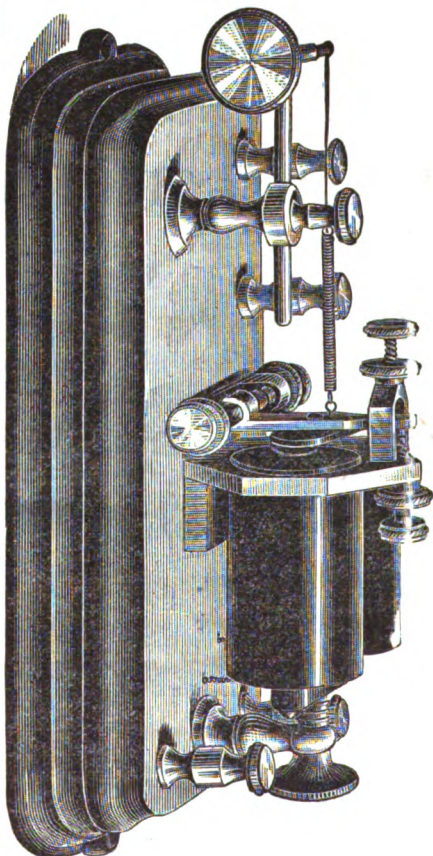
GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET: \$7.50.

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE 7.50, carefully boxed and sent by mail, prepaid, to any part of the United States.

All of these prices subject to liberal discount on orders in quantity.

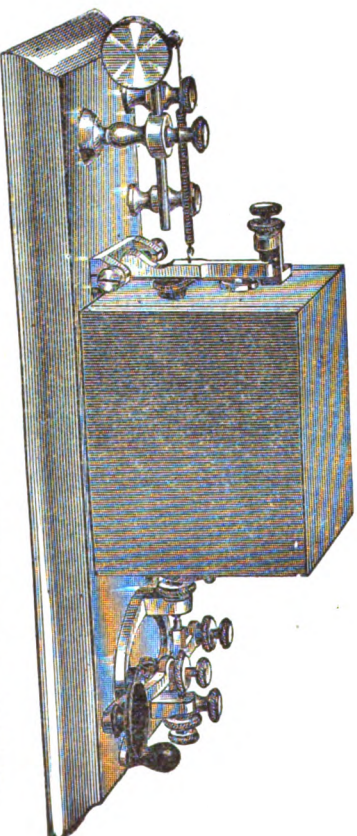
J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.



\$7.50.

FIRST CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Surbase, Extension Adjustment. Price, \$7.50.



\$11.00.

BOX SOUNDING RELAY AND STEEL LEVER KEY.

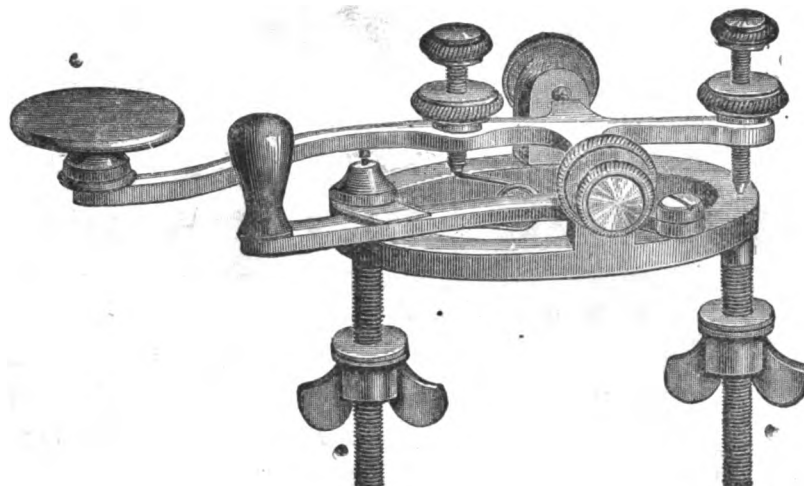
COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$11.00; without Key, \$8.50.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:

The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Compay Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Our Steel Lever Solid Trunnion Key

is now well known throughout the United States and Canadas as being the most satisfactory, durable and perfect key for Morse Telegraphing.

Its great popularity since its first introduction has caused many attempts to produce a key having at least equal merit. But, after two years' trial in thousands of different places, it still remains

“A Number 1,” Ahead of all,

while its competitors drop out and cease to be heard from.

Various absurd contrivances, more like Ticket Punches than Telegraph Keys continue to be put forward as being equal or better keys, but we would say to all who wish to possess a perfect instrument that

“The Bunnell Steel Lever Key”

is beyond all comparison,

THE BEST.

J. H. BUNNELL & CO.,

FIRST-CLASS TELEGRAPH INSTRUMENTS & MATERIALS OF EVERY DESCRIPTION,

112 Liberty Street, New York,

CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells, District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS,

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

GEO. WESTINGHOUSE, JR. Pres't. ROBERT FITCAIRN, Treasurer.
O. H. JACKSON, Vice Pres't and Gen'l Manager.

ARAP T. BOWMAN, Secretary. HENRY SNYDER, General Agent.

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
sole Owners and Manufacturers of the only practically suc-
cessful

SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Elec-
tricity.

Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.

Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnish-
ed upon application.

OFFICE AND WORKS:

Corner Fayette Street, Garrison Alley and Duquesne Way.

"Sketches from Texas Siftings"

NOW, READY.

"Sketches from Texas Siftings"—216 pages, con-
taining more than one hundred original humorous Sketches
written by Alex E Sweet and J. Armoy Knox, editors of *Texas*
Siftings, the celebrated humorous weekly. The book con-
tains 55 original illustrations. The demand for this book
has never been equalled in the history of American litera-
ture. 12,000 copies were ordered by booksellers before the
first edition came from the press.

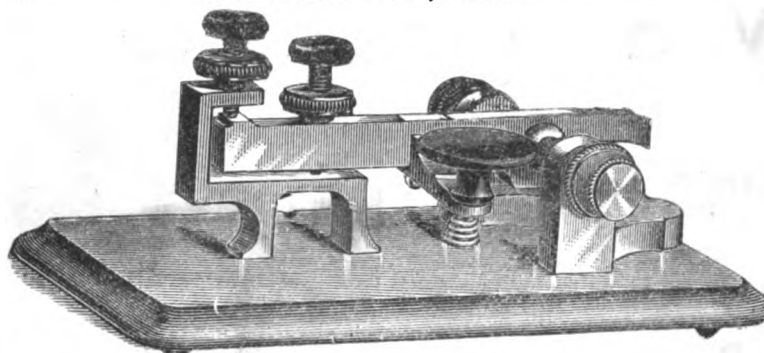
Bound in Paper,.....50c.

" " Cloth,\$1.00

For above price (in stamps) it will be mailed by Sweet &
Knox, Austin, Texas, to any address, postage prepaid, or it
can be obtained from any bookseller or newsdealer in the
United States.

NEW MECHANICAL TELEGRAPH INSTRUMENT.

PATENTED APRIL 4, 1882.



COMBINED KEY AND SOUNDER.

NO BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER

For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is *always ready for use*.

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or register-
ed letter.

J. H. BUNNELL & CO., Telegraph and Telephone Supplies,
112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

ILLUSTRATED CATALOGUES OF MAY, 1882?

If not, send your address by postal card or letter and you will get one by return mail
It contains Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instru-
ments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.



The Works of the JNO. A. ROEBLING'S SONS CO., at Trenton, N. J., have facilities for producing large quantities of Telegraph
Wire on short notice. The Belgian system of rolling long lengths of wire rods, and improved methods of galvanizing, were
first introduced in the United States at these works. It insures the production of wire with few joints, and a thick coating
of zinc.

Western Electric Company, CHICAGO. NEW YORK. INDIANAPOLIS.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES,

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANSON STAGER, *President.*ENOS M. BARTON, *V.-President.*

CATALOGUES

sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE |
|---|--------|-------|
| I—Complete Set of Catalogues..... | 286 | 20c. |
| II—Telegraph Instruments and Supplies..... | 64 | 6c. |
| IV—Insulated Wire (included in II). | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 22 | 2c. |
| VI—Electro-Medical Apparatus..... | 22 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 22 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 2c. |
| XI—Magnets for Mills..... | 20 | 2c. |
| Str Wm. Thomson's Nautical Instruments... | 24 | 2c. |

THE WESTERN ELECTRIC COMPANY,

62-68 NEW CHURCH STREET,
NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

THE BROOKS PATENT INSULATORS

WERE AWARDED

THE FIRST PREMIUM

At the Paris Exposition of 1867.

At the Vienna Exposition, 1873.

At the Cincinnati Industrial Exposition in 1874.

And at the Centennial Exposition at Philadelphia in 1876.

MANUFACTURED AND FOR SALE BY

DAVID BROOKS,

22 South 21st Street, Philadelphia.

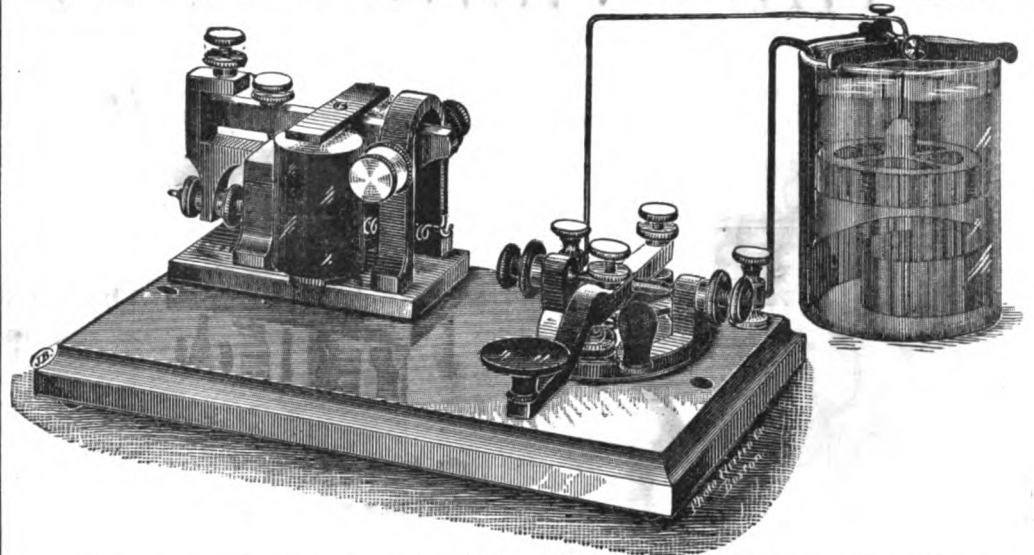
Operators' Cramps cured by

LITTLE GIANT FRENCH BATTERY

Relieves Rheumatism
and all Nervous Com-
plaints. Supersedes all
others. Send for circular.

C. E. JONES & BRO.
Cincinnati, Ohio.

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



Price for the Complete "Gem" Learners' Outfit. \$3.75.

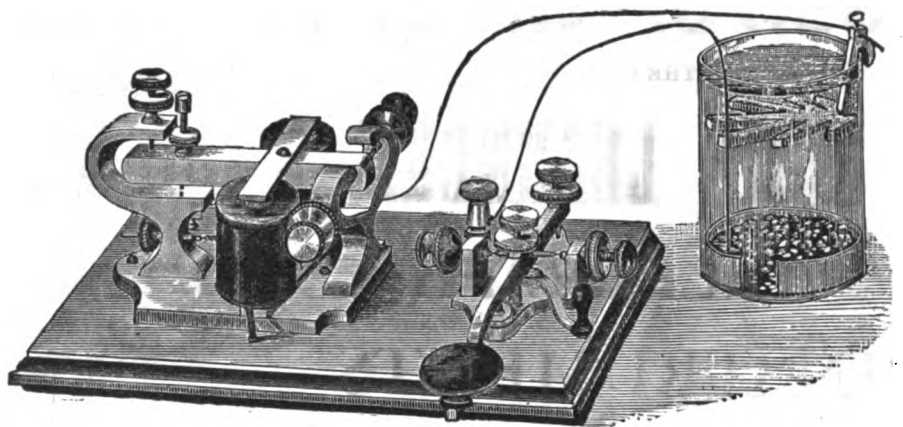
Consisting of the above large sized Sounder and Key, a large Cell of Callaud Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument that has nicely finished BRASS Sounder and Key Lever, with perfect adjustments for both.*

| | | | |
|---|--------|--|------|
| Price for Complete Outfit..... | \$3.75 | Price for Instrument alone, by mail, post-paid, \$3.60 | |
| “ Instrument alone..... | 3.06 | “ Instrument alone, for lines 1 to 15 miles..... | 3.60 |
| “ the whole outfit (except Glass Jar), with Key and Sounder separate, by mail, post-paid..... | 4.32 | “ Instrument alone, for lines 1 to 15 miles, by mail, post paid..... | 4.05 |

Send for Circular.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,
No. 30 Hanover Street, Boston, Mass.



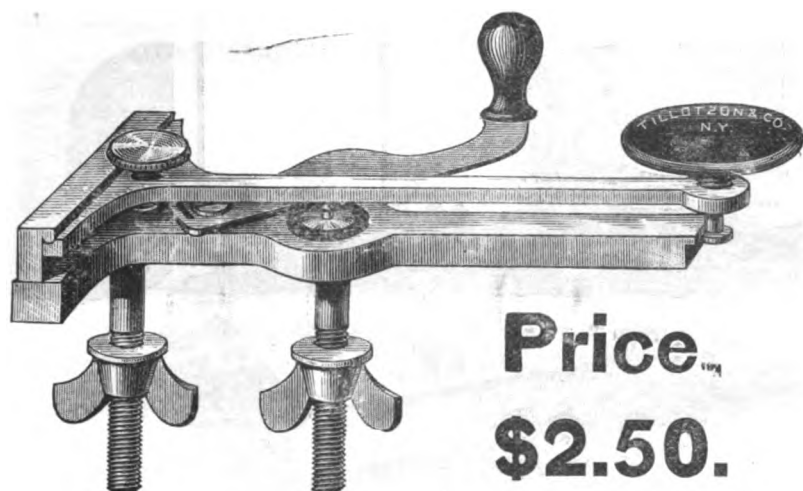
No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of: Sounder, Key, either on 1 base or separate, 5x7, Callaud Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent O. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

This Key has Pure Platinum Points.

A. B. LYMAN, 36 South Water St., Cleveland, O.

THE "VICTOR" TELEGRAPH KEY.



Price
\$2.50.

PATENT APPLIED FOR.

*The Greatest Improvement in Telegraph Keys
ever made.*

THE EASIEST WORKING.

THE MOST POSITIVE CONTACT.

The Lightest Lever.

The Most Perfect in Construction.

No Trunnion Connections.

No Side Motion to Lever.

No Back Adjusting Screw.

The Neatest, Nicest, Handiest and Best Key
in the World.

Since the earliest days of Morse Telegraphy there has been little or no radical change in Telegraph Keys until the invention of the Victor Key.

Telegraphers who take hold of the "Victor" Key will at once notice that there are but two points of adjustment to regulate. These are the play of the lever and the stiffness of the spring. There are no loose trunnions to tighten up, and no tight trunnions to loosen. The lever can never move to one side or the other; and the point can never be worn into wedge shape. The play of the lever must of necessity be directly up and down, without side motion; and consequently the points must always strike fairly and squarely. The imperfect trunnion connections of all old style keys are completely done away with in the "Victor," and the five minutes' labor of the "relief" operator in twisting adjustment screws to get his key lever to work "to suit" are at once ended. These are the most prominent points that will present themselves to the Telegrapher who uses the "Victor" key for the first time. Add thereto the light **STEEL** lever, which also prevents wearing of the connection, and the long leverage, and you have the two leading advantages claimed for the most perfectly improved of modern telegraph keys. By a turn of the knob to the left the play of the lever is decreased, or by a turn to the right it is increased, thus avoiding the imperfect set screw adjustment heretofore universally in use. These advantages present themselves so clearly and emphatically to every telegrapher that this key has only to be tried to receive the commendation already universally accorded it by every telegraph man who has examined it, which is "THE BEST KEY I EVER SAW."

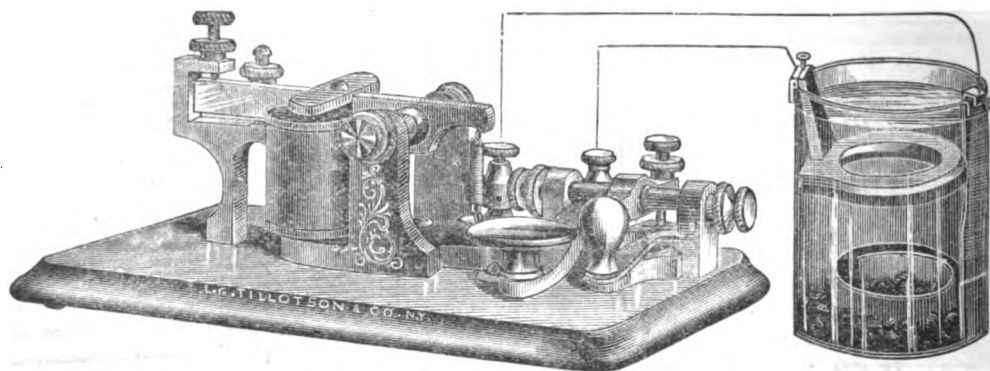
To enable all to test the merits of this great invention, we will, on receipt of price, \$2.50, send, post-paid, by registered mail, to any part of the United States or Canada, a sample VICTOR KEY.

VICTOR KEY mounted on highly polished Hard Rubber Base, with Top Connections, \$3.00, post-paid.

\$3.75. Great Reduction in Price \$3.75.

OF THE CELEBRATED

HOME LEARNERS' TELEGRAPH INSTRUMENTS



Owing to the great demand for these popular instruments, we have been compelled to enlarge our facilities for their production, and are now making them in such quantities as to admit of a considerable reduction in price, which reduction we now give our customers the advantage of. All of these Instruments will be manufactured as heretofore in the best manner, and they will be found the best Student's Apparatus in the market.

For the above Complete and Perfect Sounder and Key Combined, on mahogany base, including Battery, Chemicals, Wire, Book of Instruction and everything necessary for a first-class Telegraph Outfit for the Student's use, for practice at home, or for operating all Short Lines of Telegraph, net cash..... \$3.75
Instruments for short circuit, without Battery..... 3.00
Same by mail, post paid..... 3.50

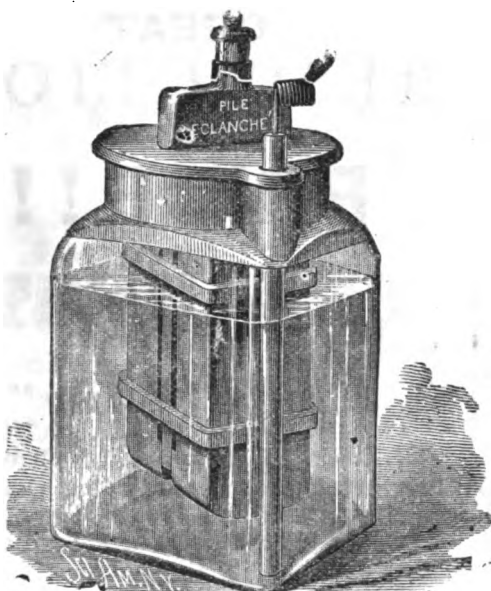
Instruments without Battery, wound with fine wire, for lines 1 to 15 miles..... \$3.75
Same by mail, post-paid..... 4.25
Cell of Battery..... .65
Instruction Book..... .30
Galvanized Telegraph Wire, per 100 feet..... .30

Remit by Postal Money Order, Draft or Registered Letter,

MANUFACTURED ONLY BY

L. G. TILLOTSON & CO.,

Manufacturers and Dealers in TELEGRAPH AND TELEPHONE SUPPLIES of Every Description,
Nos. 5 and 7 Dey Street, New York.

LECLANCHÉ BATTERY. (Patented.)**THE GREAT TELEPHONE BATTERY.**

THE REALIZATION OF
SIMPLICITY AND EFFICIENCY

IN ELECTRIC OPEN CIRCUIT BATTERIES.

Free from Acid. Emits no Odor. Does not get out of Order.
Lasts without renewal from six months to several years, according to use.

ADOPTED AND USED BY THE
American Bell Telephone Company,
Metropolitan Telephone and Telegraph Company,
Western Union Telegraph Company

Gold and Steel Telegraph Company, with their battery telephones,

And by all the Telephone Companies and Exchanges in the United States.

The attention of the public is called to the new form of Leclanché Battery, in which the porous cell is dispensed with and for it substituted a pair of compressed Pilaques or Prisms, which are simply strapped to the Carbon (as shown in cut).

The Prism Battery is more easily and cheaply cleaned and removed than any other battery.

Beware of Imitations and Worthless Imitations.

Every genuine Leclanché Battery has the words Pile Leclanché stamped on the carbon head, jar, and prisms. All others are spurious.

"Prism" and Porous Cell Batteries for sale in any quantity
Bine and Sal Ammoniac of superior quality.

The Leclanché Battery Co.,

149 West 18th St., New York.

Or L. G. TILLOTSON & CO.,

5 & 7 Day Street, New York.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FISHING

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE.

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGALAR ALARM AND ANNUNCIATOR WIRE

LEAD-ENCASED WIRE, CABLE, ETC.

OFFICE AND FACTORY: 67 STEWART STREET

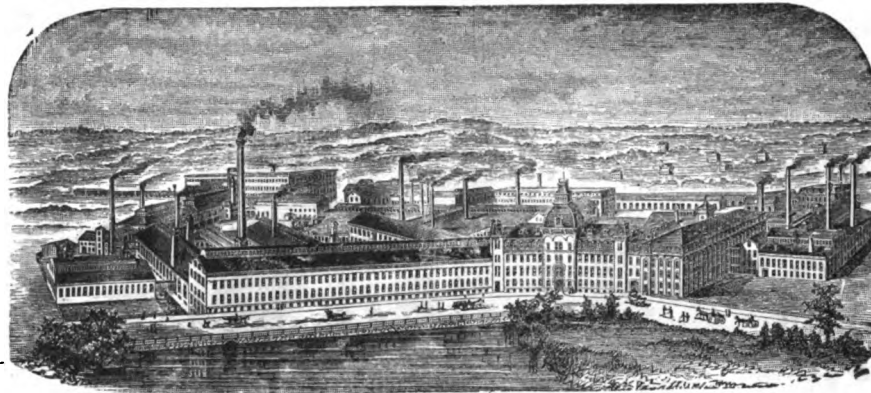
PROVIDENCE, R. I.

W. H. SAWYER, Electrician and Rep'r.

TELEGRAPH WIRE.

WASHBURN & MOHN MANUFACTURING COMPANY.

ESTABLISHED 1871. CAPITAL \$1,500,000.



WORCESTER, MASS.

21 OLIVE STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequalled in that particular.
(Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,

(In connection with the DOUGLAS STEEL FURNACE.)

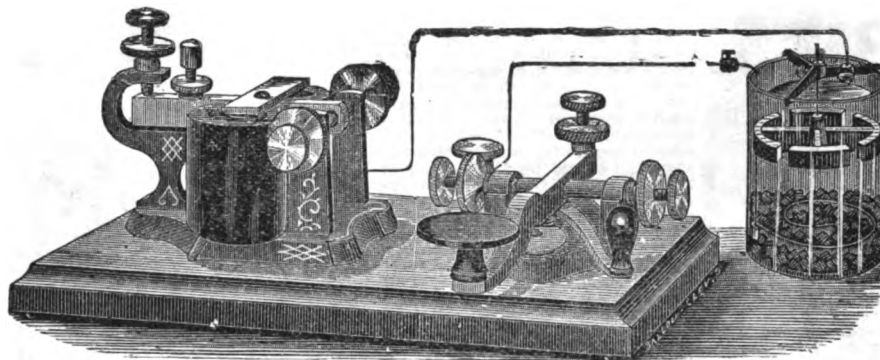
All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

EUREKA OUTFIT NO. 2.

Price \$4.00.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK

SENT ON RECEIPT OF \$4.00; OR SENT C. O. D. \$3.00 IF \$1.00 IS SENT WITH THE ORDER.

The above Instrument and Battery are nicely made, durable and warranted to work good

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

144 Superior Street, Cleveland.

FREE TO YOU

By Mail, on receipt of 25c. in currency or stamps.
HOW TO BECOME A TELEGRAPH OPERATOR. The most complete illustrated

Telegraph Instruction Book in the world.

C. E. Jones & Bro.: Dear Sirs:—Instruction Book received O. K., and many thanks. It is worth five times what it cost. If a person could not learn to be an operator after studying it, THEY HAD BETTER GIVE UP. Yours truly,

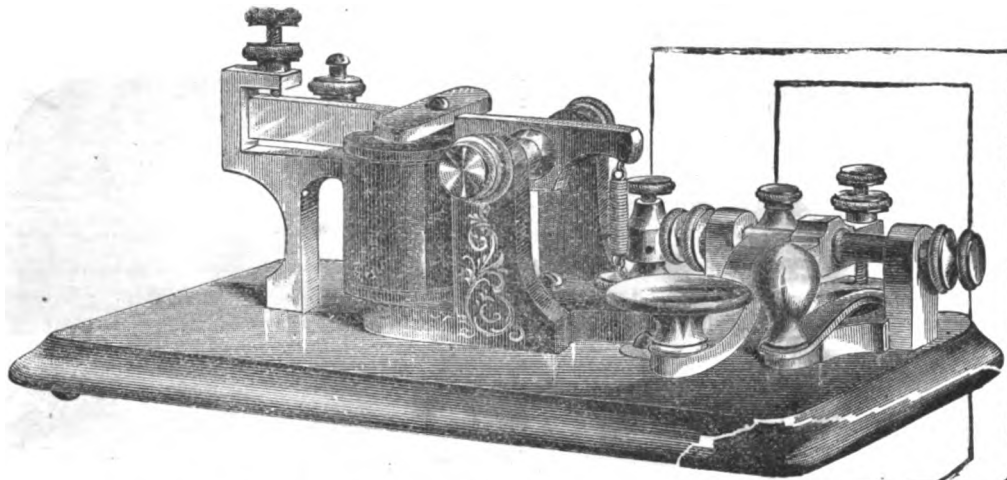
A. L. JAMES, Tipton, Tulare County, Cal.

NOW! RIGHT! NOW! while fresh in your mind, is the best time to send your order, before you misplace this paper and forget our address, and your opportunity is gone.

C. E. JONES & BRO., Telegraph, Telephone and Electrical Supplies,
No. 51 West Fourth Street, CINCINNATI, O.

The "Morse" Learners' Outfit \$3.75.

**GREAT
REDUCTION
IN
PRICE!!
THE BEST.**



THE BEST.

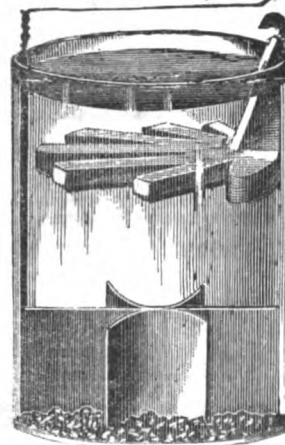
Price, \$3.75, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.
 "Morse" instrument alone, without battery..... \$3.00
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 3.75
 Cell of battery complete..... .65
 "Morse" Learners' Instrument, without battery, sent by mail..... 3.50
 (Battery cannot be sent by mail.)

Instruction Book FREE.

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



The "Morse"
 Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners' Instruments for short or long lines, from a few feet up to 20 miles in length,
YET OFFERED!
 You are **SURE** of getting
THE BEST THAT IS MADE
IF YOU SELECT THE "MORSE."

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.



YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "75," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 either designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys, Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents; also Embellished Keys 25 for 25 cents. Samples of Operators' Cards 10 cents. 50 New and laughable Illustrations, from Flirtation to Marriage, see cut above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 20c. 25 side-splitting Comic Cards, 20c. Morocco card cases, two pockets, 10c. 100 finely printed letter heads, \$1.00 100 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 10c. Agents Wanted to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also satin fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and "Tipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200, no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from 5 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,
F. P. MUNN, CLYDE, Wayne Co., N. Y.



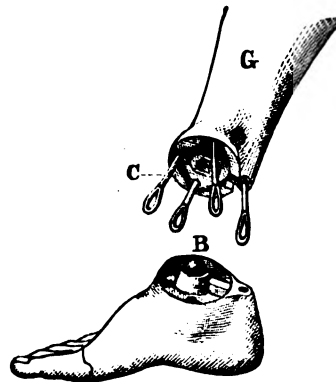
CALIGRAPHS SOLD and orders filled immediately

STENOGRAPHERS furnished business men without charge for my services.

SHORT-HAND TAUGHT.

Send for Circular to

W. G. CHAFFEE,
 Oswego, N. Y.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
 With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.
GEO. E. FULLER,
 Successor to Dr. D. BLY, Rochester, N. Y.

IT PAYS to sell our Hand Printing Rubber Stamps. Samples Free. **C. FOLJAMBE,**
 Successor to G. A. HARPER & BRO. Cleveland, O.

Found at Last.
**A CHEAP
 COUNTER CLIP,**

(Patented July 18, 1882.)

CHEAPER THAN PASTE.

Blanks Removed Without Tearing.

Price, post-paid, 15 cents. Per doz., post-paid, \$1.50. Discounts to the Trade or to Telegraph Co.s, in quantities. Larger sizes made to screw to wall, for Paper Bags, Wrapping Paper, &c. Circulars free. Address,

W. W. PRICHARD,
 Ironton, Ohio.

SHORTHAND Writing thoroughly taught by mail or personally. Situations procured for pupils when competent. Send for circular. **W. G. CHAFFEE,** Oswego, N. Y.

I will teach any operator the Corresponding Style of Phonography, who will sell a Galigraph for me

HALBERT E. PAINE, late Comm'r Patents. **STORY B. LADD,**

PAINE & LADD,

Solicitors of Patents and Attorneys in Patent Cases,

Washington, D. C.

The Finn Lightning Arrester.



This new and improved Arrester will effectually short circuit all free electricity at a point outside any office or building.

Price—\$4.00 per dozen.
 \$30.00 per 100.

Samples by mail on receipt of 50 c.

For further particulars address or call upon
Finn Lightning Arrester Co
 Elyria, Ohio.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, OCTOBER 20, 1882.

WHOLE NO. 352.

ANNUAL REPORT OF THE PRESIDENT OF THE WESTERN UNION TELEGRAPH COMPANY, FOR THE YEAR ENDING JUNE 30, 1882.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, October 11, 1882.

CAPITAL STOCK.

The *Capital Stock* of the Company is \$80,000,000, of which \$20,172.50 belongs to, and is in the Treasury of the Company. A small portion of the Capital Stock is still represented by certificates of indebtedness in the hands of the Union Trust Company, in trust for the parties entitled thereto.

BONDED DEBT.

The *Bonded Debt* at the close of the year was as follows:

| | |
|---|-----------------------|
| Bonds due March 1, 1900, 6 per cent..... | \$941,382.00 |
| Bonds due May 1, 1900, 7 per cent..... | 3,920,000.00 |
| Bonds due May 1, 1902, 7 per cent..... | 1,373,000.00 |
| | <u>\$6,234,382.00</u> |
| Less: Balance of Sinking Funds appropriations, not yet used for redemption of bonds, held by the Union Trust Co., Trustees..... | 225,191.24 |
| | <u>\$6,009,190.76</u> |

During the year sterling bonds, due March 1, 1900, to the amount of £2,000, were redeemed by the Trustees of the Sinking Fund.

BUSINESS OF THE YEAR

| | |
|--|-----------------------|
| Surplus July 1, 1881..... | \$127,258.76 |
| The revenue, expenses and profits of the year ending June 30, 1882, were as follows: | |
| Revenues..... | \$17,114,166.92 |
| Expenses (including leased line rentals and taxes)..... | 9,966,095.92 |
| Profits..... | <u>7,118,070.00</u> |
| | <u>\$7,245,328.76</u> |

From which there was applied:

| | |
|--------------------------------------|-----------------------|
| For Dividends..... | \$4,798,473.41 |
| For interest on bonds..... | 427,091.34 |
| For Sinking Fund Appropriations..... | 40,097.98 |
| | <u>\$5,265,662.73</u> |
| Leaving a balance of..... | <u>\$1,979,666.03</u> |

Represented as follows:

| | |
|--|-----------------------|
| Surplus of net revenue for the year over dividends, interest and Sinking Fund appropriations.... | \$1,852,407.27 |
| Surplus at commencement of year, as above..... | <u>127,258.76</u> |
| | <u>\$1,979,666.03</u> |

For new property there was appropriated during the first quarter of the year:

| | |
|---|---------------------|
| For construction of new lines and erection of additional wires..... | \$202,290.51 |
| For telegraph stocks and other properties..... | <u>113,135.39</u> |
| | <u>\$315,425.90</u> |

| | |
|--|----------------------|
| Deducting which, leaves surplus June 30, 1882..... | <u>\$1,664,240.1</u> |
|--|----------------------|

The revenues for the year do not include the surplus funds in the treasury of the American Cable

Company, which were taken over with the lease of that company, subject to certain unadjusted liabilities, which have not been fully ascertained.

The management has determined, as published in the quarterly statement of March, 1882, that from October 1, 1881, all outlays for construction and investments in new property which go into the plant shall be provided for out of surplus assets in the treasury, other than the cash surplus of current earnings. As no sales of any part of such surplus assets have been made, there has been advanced as a loan to the account of construction and purchases, to meet the outlay for these objects during the remainder of the year, \$835,676.08 from the cash surplus as above stated.

It has long been the established policy of English corporations, founded on sound principles, to provide for extensions of the plant with additional capitalization in stock or bonds, leaving all the net revenues above current expenses, interest and sinking fund, applicable to dividends. But the surplus assets of the company, in the form of marketable securities in the treasury, being more than sufficient to meet any constructions or purchases likely to be made for some years, additional capitalization will not be necessary.

This policy places the question of continuing at least the present rate of dividends, beyond possible contingency, with a probable increase of this rate when the Board shall deem it wise to make such increase.

GENERAL STATEMENT.

The following exhibit shows the revenues and disbursements of the Company for sixteen years, from July 1, 1866.

| | |
|--|------------------------|
| Surplus of Income Account, July 1, 1866..... | \$275,357.24 |
| Net revenues for sixteen years, from July 1, 1866, to June 30, 1882..... | 58,103,951.70 |
| Making an aggregate, June 30, 1882, of..... | <u>\$58,384,308.94</u> |

During this period there was applied:

| | |
|--|------------------|
| For cash dividends to stockholders (including dividends payable July 15, 1882)..... | \$36,332,400.75 |
| For cost of 59,606½ shares of Western Union Telegraph Stock, purchased and owned by the Company, which was distributed to Stockholders in 1879..... | 3,302,198.90 |
| For cost of 72,010 shares of Atlantic & Pacific Telegraph Stock, purchased and owned by the Company, the proceeds of which in Western Union stock were distributed to stockholders in 1881.... | 1,806,250.00 |
| For interest paid in Company's Bonds..... | 6,301,562.49 |
| For cost of 396 ¼-100 shares Western Union Stock, purchased and owned by Company, which were cancelled to make the Capital Stock, after the issue of the new stock in 1881, exactly \$80,000,000.. | <u>26,336.00</u> |

| | |
|--|------------------------|
| For amount reserved for interest on Bonds and for Sinking Funds, accrued to June 30, but then not yet due and payable..... | 106,086.64 |
| | <u>\$39,875,334.78</u> |
| Leaving a surplus of..... | <u>\$18,508,974.16</u> |

Which is represented as follows:

| | |
|---|------------------------|
| Construction of new lines, erection of additional wires, patents, etc.... | \$9,294,683.77 |
| Purchase of telegraph lines, and of stocks of companies leased by the Western Union Company, upon which interest or dividends are paid as rental..... | 2,440,196.06 |
| Gold and Stock Telegraph Company's Stock (18,906 shares)..... | 1,176,009.10 |
| International Ocean Telegraph Company's Stock (16,170 shares)..... | 961,606.42 |
| Brooks Underground Telegraph Company's Stock (1,000 shares)..... | 95,000.00 |
| Southern Bell Telephone and Telegraph Company's Stock (1,687 shares)..... | 84,325.00 |
| Sundry other Stocks and Bonds..... | 102,965.68 |
| Western Union Bonds, redeemed and cancelled..... | 1,359,607.69 |
| Sinking Funds (portion not yet used for redemption of bonds, exclusive of interest allowed by Trustees)..... | 200,767.40 |
| Broadway and Dey Street Building..... | 2,340,639.52 |
| Less amount provided from the proceeds of bonds..... | 1,802,202.00 |
| | <u>538,437.52</u> |
| Real estate other than above..... | 408,745.41 |
| Supplies and material on hand unissued..... | 182,290.08 |
| Surplus June 30, 1882..... | <u>1,664,240.13</u> |
| | <u>\$18,508,974.16</u> |

| | |
|--|----------------------|
| On account of these assets, a Stock Distribution was declared in 1881, to the amount of..... | <u>15,526,590.00</u> |
|--|----------------------|

Deducting which, leaves a balance of \$2,982,384.16

The foregoing general statement shows what disposition has been made of the net revenues of the company.

The assets which have been purchased and paid for out of the net revenues in the treasury, are stated in the foregoing schedule at their cost value.

The company has other large and valuable assets, which were not purchased and paid for at a fixed price, but which were taken over under contracts with the several companies absorbed by lease, or amalgamation; and which therefore had no specific cost value at which they could be entered into the general accounts of the company. These are included in the following lists of marketable assets in the treasury of the company, June 30, 1882, with their marketable value as nearly as can be ascertained.

The foregoing list does not embrace the large amount of stocks held by this Company in telegraph companies whose lines have been leased by this Company, and the greater part, and in most instances the entire stocks, subsequently purchased,

| | Number of Shares | Par Value. | Marketable Value |
|--|------------------|----------------|------------------|
| Gold and Stock Telegraph Co.'s stock..... | 19,438 | \$1,943,900.00 | \$1,866,048.00 |
| International Ocean Telegraph Co.'s stock..... | 16,231 | 1,623,100.00 | 1,568,176.00 |
| American Speaking Telephone Co.'s stock..... | 12,000 | 1,200,000.00 | 1,200,000.00 |
| Metropolitan Telephone and Telegraph Co.'s stock..... | 4,000 | 400,000.00 | 600,000.00 |
| Great North Western Telegraph Co.'s stock..... | 2,550 | 255,000.00 | 510,000.00 |
| Gold and Stock Telegraph Co. of California, stock..... | 2,875 | 287,500.00 | 431,250.00 |
| Bell Telephone Co. of Philadelphia, stock..... | 1,500 | 125,000.00 | 35,000.00 |
| Philadelphia Local Telegraph Co.'s stock..... | 12,000 | 300,000.00 | 300,000.00 |
| Dominion Telegraph Co.'s stock..... | 5,716 | 288,800.00 | 288,800.00 |
| Southern Bell Telephone and Telegraph Co.'s stock..... | 1,787 | 178,700.00 | 178,700.00 |
| Telephone and Telegraph Construction Co. of Detroit, stock..... | 5,944 | 148,600.00 | 148,600.00 |
| Central District and Printing Telegraph Co. of Pittsburg, stock..... | 1,160 | 136,000.00 | 136,000.00 |
| American District Telegraph Co. of New York, stock..... | 2,614 | 261,400.00 | 130,700.00 |
| Brooks Underground Telegraph Co.'s stock..... | 1,000 | 100,000.00 | 95,000.00 |
| Gold and Stock Telegraph Co.'s bonds..... | | 65,300.00 | 65,300.00 |
| Boston District Telegraph Co.'s stock..... | 6,023 | 150,575.00 | 60,230.00 |
| Commercial Telephone Co. of Troy, stock..... | 700 | 17,500.00 | 43,750.00 |
| Bell Telephone Co. of Canada, stock..... | 372 | 37,200.00 | 37,200.00 |
| American District Telegraph Co. of Baltimore, stock..... | 9,000 | 45,000.00 | 27,000.00 |
| Commercial Telephone Co. of Albany, stock..... | 88 | 8,800.00 | 27,000.00 |
| Western Union Telegraph Co.'s stock..... | 20,100 | 20,100.00 | 17,587.50 |
| Northern Pacific R.R. Co.'s preferred stock..... | 10 | 9,000.00 | 8,550.00 |
| Anglo-American Telegraph Co.'s stock..... | | 6,400.00 | 6,400.00 |
| Other miscellaneous securities, in small lots, consisting of telegraph and railroad stocks, bonds and scrip..... | | 86,387.00 | 27,162.00 |
| | | | \$8,138,553.50 |

and the telegraph properties substantially merged into the Western Union system. Among these may be enumerated \$3,963,300 of the stock of the old American Company; \$643,500 of the Atlantic and Ohio; \$2,331,600 of the California State; \$125,000 of the Chicago and Mississippi; \$629,000 of the Franklin; \$100,350 of the Illinois and Mississippi; \$1,457,500 of the Pacific and Atlantic; \$39,475 of the Southern and Atlantic; 119,750 of the Vermont and Boston; \$530,550 of the Washington and New Orleans; \$1,000,000 of the South Western; \$204,400 of the Missouri and Western; and miscellaneous stocks of sundry smaller companies, amounting to over \$1,000,000, all having a marketable value, and amounting in the aggregate to over \$12,550,000.

The stocks of the United States Company, \$6,000,000; the Atlantic and Pacific, \$4,000,000; and the American Union, \$10,000,000, and \$5,000,000 bonds of the latter company, which were directly capitalized into this Company, by the issue of its stock in exchange therefor, are, of course, not marketable assets, and therefore not included in either list. Over \$1,000,000 of stock and \$375,000 of bonds of the Mutual Union Telegraph Company which are marketable assets, are not included as such, because they were not finally paid for and taken into the accounts of the Company until after the expiration of the year for which this report is made.

These together aggregate over sixty millions of stocks and bonds of other companies, including those that have been absorbed by this Company since the beginning of 1866, besides over ten millions expended in the direct construction of new lines. Of the securities over eight millions in value

as per foregoing table, are classed as saleable, and the proceeds thereof may be realized whenever they can be more profitably invested in other telegraph properties.

GOLD AND STOCK AND INTERNATIONAL OCEAN TELEGRAPH COMPANIES.

During the year, and dating from the first of January, 1882, the Company has entered into contracts with the Gold and Stock Telegraph Company and with the International Ocean Telegraph Company to manage and operate the lines, property and business of those companies for a term of ninety-nine years, guaranteeing to the stockholders quarterly dividends at the rate of six per cent. per annum; and being entitled to all the revenues.

These agreements are substantially, but not strictly, in the form of leases. They effect a great saving in the executive and other expenses of the two organizations; the business being now conducted under separate departments of this Company. The experience of the first six months' operation indicates that these contracts will be a source of handsome profit to this Company, not only from the economies mentioned, but also from the considerable growth of the business.

| Year. | STATISTICS.—The following Table exhibits the amount of Lines Operated, Number of Offices, Number of Messages Sent, Receipts, Expenses and Profits for Each Year since 1866. | | | | |
|-------|---|---------|----------|------------|---------------|
| | Poles. | Wire. | Offices. | Messages. | Receipts. |
| 1866. | 37,380 | 75,636 | 2,260 | 5,879,352 | 6,685,934.38 |
| 1867. | 44,270 | 85,291 | 2,568 | 6,404,595 | 7,004,609.19 |
| 1868. | 50,158 | 97,684 | 3,219 | 7,834,933 | 7,814,918.50 |
| 1869. | 52,099 | 104,84 | 3,972 | 9,157,646 | 7,118,247.96 |
| 1870. | 54,102 | 112,131 | 4,606 | 10,646,499 | 7,637,444.88 |
| 1871. | 56,093 | 121,151 | 5,247 | 12,444,592 | 8,457,008.77 |
| 1872. | 58,083 | 137,150 | 5,740 | 14,456,832 | 9,333,018.51 |
| 1873. | 60,073 | 154,715 | 6,188 | 16,439,256 | 9,964,963.66 |
| 1874. | 62,063 | 172,735 | 6,585 | 18,421,716 | 10,634,973.89 |
| 1875. | 64,053 | 190,755 | 6,982 | 20,404,180 | 11,305,983.97 |
| 1876. | 66,043 | 208,775 | 7,379 | 22,386,644 | 12,000,997.97 |
| 1877. | 68,033 | 226,795 | 7,776 | 24,369,108 | 12,729,157.83 |
| 1878. | 70,023 | 244,815 | 8,173 | 26,351,572 | 13,458,317.67 |
| 1879. | 72,013 | 262,835 | 8,570 | 28,334,036 | 14,187,477.51 |
| 1880. | 74,003 | 280,855 | 8,967 | 30,316,500 | 14,916,637.35 |
| 1881. | 76,003 | 298,875 | 9,364 | 32,298,964 | 15,645,797.19 |
| 1882. | 78,003 | 316,895 | 9,761 | 34,281,428 | 16,374,957.03 |

GENERAL REMARKS.

The stockholders may be congratulated on the very handsome returns made for the past year. Referring to the customary table exhibiting the operations of the Company for sixteen years, especial attention is called to the increases shown during the past five years; and especially the gratifying exhibit of an increase during the last year over the year preceding of \$3,053,355.91 in gross revenues, and of \$1,477,429.88 in the net profits realized.

The earnings of the Gold and Stock Telegraph Company and the International Ocean Telegraph Company for six months of the year, and of the two American cables for one month, which were not included in the estimates when the last annual report was made, have contributed to make the gross receipts some sixteen hundred thousand dollars more than was estimated; while the expenses of those new departments and the payment of rentals guaranteed have also largely increased the expenditures, making the net profits, however, \$618,070 more than was estimated.

As the revenues of these departments will here-

after be permanently included in the earnings of this Company, the gross receipts for the ensuing year are estimated at nineteen millions; and the net profits at eight millions of dollars.

Respectfully submitted,

NORVIN GREEN,
President.

[For the JOURNAL OF THE TELEGRAPH]

SOUND.

AN ELECTRICAL PHENOMENON.

To-day a great revolution impends in regard to the nature and philosophy of sound. The fact must soon be recognized that the telephone undermined the whole structure of the ancient and accepted science of sound, when it brought into notice the agency of electricity in its production and transmission.

This was indeed the first practical suggestion that sound belongs to the wide realm of electrical phenomena. Already the minds of thoughtful men are being freed from the iron dominion of the old theory of the mechanical action of waves of air upon the vibrating drum of the ear. The essential irrationality of the theory makes itself seen and felt. Men are now ready to listen to the fact that the "drum" of the ear is in no sense a resounding drum, beaten by waves of air. A membrane diminutive and placid, it would never have been supposed to play the part of a tense drum-head, except in blind support of a theory. The imagined vibratory action of the *membrana tympani* is a mechanical impossibility. Those membranes are not flat, as is popularly supposed, but funnel-shaped, with a depressed centre surrounded by sides gently convex outwards. They cannot therefore act like stretched membranes, and vibrate like drum-heads. And, too, the auditory ossicles are so attached to those membranes as to be subject to a synchronous vibration. This is impracticable. These facts alone are sufficient to destroy the accepted theory of sound.

In place of the present really crude and impossible mode of explanation, experimental facts are to-day forcing upon us a better one, which must hereafter be known as *The Electrical Theory of Sound*. To this theory I now invite attention.

Sound, like light, is capable of radiation, reflection, refraction, diffraction, diffusion and, as recently claimed, of *polarization*. It is also capable of transmutations with light. COULON, of Rouen, GENTILI, of Leipzig, and others, by different processes have changed sound into light; and BELL, of Boston, has changed light into sound. These facts establish a correlation between sound and light, and entitle the former to a position in the category with the latter, among the affections of the Great Primordial Force.

The telephone, the phonograph, the agaphone and the transmutations give to sound a character wholly new. The human voice is conveyed through the medium of the telephone wire the distance of several hundred miles. When we consider that advancing waves rapidly and symmetrically diminish both in amplitude and force, we know of a certainty that sound, if thus conveyed, and not in some manner supplemented in its course, can by no possibility reach more than a short distance;—simply a few yards. As no augmentation of the initial force creating the sound is possible during its transmission, the claim of the wave-theory is therefore disproved by this phenomenon.

Sound flies with greater than lightning speed along the telephone wires. The statement that undulations having a velocity of 1,100 feet per second in the air, can suddenly, and without apparent cause, start in to greater than lightning velocity along

wires is simply preposterous. The results observed through the medium of the telephone are therefore due to some other cause than mere wave-motion. In view of the undulatory theory of sound, the assertion that sounds need not be discrete—that where numerous sounds are simultaneously received by the ear, they fall as one composite wave upon the *membrana tympani*, becomes a perversion of fact and philosophy. According to the laws of wave-motion there must necessarily be interference.

The phonograph simultaneously receives and records an unlimited number of different and distinct sounds, and correctly reproduces them at the will of the operator. This is accomplished through the instrumentality of a single vibrating point. If sounds were transmitted through the medium of undulations the number of points which would be required to record the whole number of sounds simultaneously received, must necessarily equal the exact number of sounds produced. A single point can by no possibility record more than one wave-amplitude at one and the same instant of time. The greatest wave-amplitude would inevitably prevent all lesser ones from acting simultaneously upon the same membrane.

At a phonographic exhibition at which several thousand persons were present the tones of a full band were received and impressed upon the instrument by means of its single point. In the reproduction which followed, every note of each instrument was clearly rendered and distinctly heard by all who were present. The rolling rattling taps of the snare-drum, the boom of the bass-drum, the screech of the piccolo, the peculiar sounds of the clarinet and the braying of the various horns were all perfectly rendered; each instrument in its own peculiar manner. It is therefore wholly irrational to suppose that the single point of the instrument was capable of responding to the various wave-amplitudes of the numerous sounds, or tones, which were simultaneously produced. In this demonstration of the phonograph we find conclusive evidence against the accepted philosophy of sound.

The agaphone furnishes the same conclusive evidence. The slightest impression made upon the transmitting disc of the instrument is conveyed a considerable distance and reproduced in sounds infinitely louder than those in which they originated. The foot-fall of a fly which no human ear can discern is thus reproduced in sounds, we are told, "apparently as loud as the tramp of an elephant." Again, the slightest feather when drawn across the disc produces a sound, "as of thunder." The laws of motion teach that waves, of whatever kind, decrease in amplitude and force as they recede from their point of origin. These experiments therefore furnish proof of the fallacy of existing theories.

The transmutations between light and sound, take sound out of the field of undulatory phenomena. The experiments of COULON, GENTILI and BELL, are conclusive upon this point. In an experiment by Prof. BELL, when intermittent beams of light were thrown upon an instrument designed for the purpose, "the effect was perfectly startling"—the sound was so loud as to be actually painful to an ear placed closely against the end of the hearing-tube."

Physiology has heretofore been made to play a false role in the usual explanation of the philosophy of sound. In the face of the most glaring inconsistencies, it has been tortured into support of existing theories. We are gravely told by physiologists that "the object of the *membrana tympani* is to receive the sonorous undulations from the air in such a manner as to be thrown by them into a reciprocal vibration"; that "every wave generated by

sound vibrations bends the tympanic membrane once in, and once out," and that these vibrations occur hundreds, or thousands of times per second. What a commentary upon such a philosophy do we find in the results obtained from a large body of musicians, vocal and instrumental. Each voice, and each instrument, has certain distinctive qualities, or characteristics, which, if the wave-theory were true, must impress the tympanic membrane each in a different manner; each producing a different amplitude of vibration upon those diminutive flabby membranes. Imagine hundreds of such differing impressions striking in waves upon the ear simultaneously, and, too, with all their natural interferences. An inconceivable confusion must necessarily be the result. Not even two tones can by any possibility be responded to by the tympanic membranes, at one and the same instant, any more than can two different tones be produced simultaneously on one and the same musical cord. Yet, what is the experience of those skilled in musical instruction? The notes of hundreds of musicians are clearly discerned and the slightest discord in a single voice, or instrument, is quickly and accurately noted. Physiological action claimed for the ear-drum, in the function of hearing, is therefore a pure absurdity. No stronger proof need be required that the present theory of sound is a fallacy of the most glaring and transparent nature.

The functions of the *membrana tympani* have been heretofore most strangely misconceived. So far from being wholly indispensable to hearing, that function is well performed in the total absence of one drum-head, and the nearly entire absence of the other. Sir ASTLEY COOPER reports the case of a gentleman in this condition who heard conversation, played the flute and sang with much taste. Such instances are not rare. A well authenticated case is reported of a man whose tympanic membranes were both destroyed by an explosion of nitro-glycerine, who afterwards could hear with more acuteness than before the accident, and with more sensitiveness than ordinary persons.

Not much in the way of vibratory movement can be claimed for loose cotton fibres, yet pellets of cotton make a good substitute in many cases of partial or total defect of the tympanic membrane. In the experiments of Prof. BELL, in the transmutation of light into sound, he discovered that cotton, silk, worsted and light fibrous materials, generally produce much louder sounds than hard, rigid bodies like crystals. If, therefore, loose and delicate substances give the best results in the development of sound due to the action of light,—and if cotton pellets, which are insusceptible to vibrations, make a fair substitute for the natural ear-drum, most assuredly have physiologists mistaken the philosophy of the action of that membrane.

The principal action of the *membrana tympani* may be supposed to consist in the defence of the delicate acoustic apparatus which is directly connected with the sensorium. Without such defence the sensibility of the organs of hearing would easily become impaired, or destroyed, by violent concussions, and by the impaction of foreign substances which so readily find their way into the external auditory canal. The soft, yielding tympanic membranes shield those more delicate structures and preserve their sensibility.

Thus the teachings of the telephone, the phonograph, the agaphone and rational physiology all oppose the wave theory of sound.

Sound is developed in the action of force upon matter, and no force which can be exercised in the production of sound is so small that electrical effect may not thereby be produced. It is a marked characteristic of electricity that slight causes pro-

duce striking effects. Prof. THOMPSON tells us that with a percussion cap and a tear for a battery, sufficient force may be developed to deflect a magnetic needle 3,000 miles distant. The foot-fall of a fly, as mentioned, produces a loud noise at a considerable distance. The action of intermittent beams of light, under favoring conditions, produces a degree of sound which is painful to the listening ear. In the phenomenon of a sigh, the air in its frictions against the walls of the air-passages develops sufficient of electricity to be carried by means of the electrical constituent of the atmosphere to the ear of the hearer.

In order to a clear and philosophical conception of the essential and inherent character of sound, it is indispensable to fully understand the agencies which have part in its production and transmission. Of these agencies, the most important, and at the same time the most imperfectly understood is the atmosphere. The most vital constituent of the atmosphere has never been referred to, as a real entity, in any formula which Science has given of its constitution. Yet, upon the action of this constituent depend the grandest terrestrial phenomena, as well as the production and transmission of sound. This constituent is the magnetic. The fact that the atmosphere is the most magnetic of all earthly bodies, except iron, nickel and cobalt—that it is a vast magnetic reservoir, has been practically ignored in our terrestrial economy. The want of a proper appreciation of this fact has been fatal to correct conceptions of physical phenomena.

If sound be expended upon the air, or more accurately, upon the magnetic constituent of the air, it is transmitted in accordance with laws that govern the transmission of the electrical principle through the air. If it be expended upon a lengthened wire, then, as sound, it is transmitted according to the laws of electrical transmission through wires.

That sound may result from force expended upon the electrical element of the atmosphere is beautifully illustrated in an incident by Sir DAVID BREWSTER. Two English travellers were surprised in their descent of Etna, by a heavy fall of snow, accompanied by heavy claps of thunder. They heard a hissing noise every time they extended their arms into the air. On extending a finger and moving it through the atmosphere in various directions, and with rapidity, they were able at pleasure to generate a variety of musical sounds, the intensity of which was such that they were perfectly heard at the distance of several yards. Thus motion, or force, expended upon an atmosphere surcharged with electricity, developed musical sounds.

The fact that sounds need not be discrete,—that where numerous sounds are simultaneously received by the ear, they fall as one composite pulse (so to speak) upon the acoustic apparatus; while it is fatal to the undulatory theory of sound, it stands, in relation to the electrical theory, virtually as a demonstration of that philosophy.

If the analogies (to water-waves), upon which the undulation was founded, were rightly applied, the whole system would tumble as readily as a house of cards. The fundamental law of interference is fatal to it. This law is a stumbling block, even to the very distinguished champion and exponent of the old theory. In view of the claim made by that theory, viz., that a thousand separate systems of air-waves may congregate in the aural passages, at the same moment, each knocking at the drum-heads with an independent rate of vibration, and different degrees of amplitude," he says: "when I try to visualize the motions of that air, to present to the eye of the mind the battling of the pulses,—direct and reverberated, the imagination retires baffled at the attempt."

Thus in view of the utterly irrational character of the old theory, *ab initio*,—the abundance of positive data furnished by recent discoveries and inventions, and the teachings of the infallible law of conservation of force, we should have little difficulty in arriving at the rational conclusion that sound is an electrical phenomenon.

H. RAYMOND ROCKE, M.D.

Journal of the Telegraph.

PUBLISHED MONTHLY, ON 20TH OF EACH MONTH, AT
195 BROADWAY.

THE JOURNAL is issued on the 20th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,730 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION

Invariably in advance.

One Copy, one year, postage included.....\$ 1.50
One Copy, six months, postage included..... .75
Single Copies, 15 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$ 2.00
Half Inch " " "..... 1.00
Quarter Column, " " "..... 4.00
Half " " "..... 8.00
One " " "..... 16.00

Charges for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, OCTOBER 20, 1882.

GENERAL MANAGER'S OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, Oct. 17, 1882.

Mr. Gerritt Smith has been appointed Electrician in charge of Circuits, with special reference to the practical working of the Automatic and Multiplex systems upon the lines of this Company, with headquarters at New York. All reports and correspondence pertaining to this branch of the service will be addressed to him, and his directions will be obeyed accordingly. Except where emergency requires the sending of reports by telegraph, they will be forwarded by mail.

THOS. T. ECKERT,
Vice-Pres. and Gen. Manager.

DISCUSSIONS ON ELECTRICITY BEFORE THE BRITISH ASSOCIATION.

THE fifty-second annual meeting of the British Association, the great scientific congress of the year, was opened in Southampton on the 23d of August. Its last meeting in Southampton was in 1846. Since that time great progress has been made in the discovery and practical application of all sciences. The number of members and associates who have announced their presence is 1,070—while the meeting in 1846 had the smallest number of members of any meeting of the association. The plan of the papers then read on electricity and cognate subjects was quite different, we will find, from those which were read at the meeting which has just terminated. The following papers were read in 1846, abstracts of which are given in the journal:—"1. New Experiments on Electro-Magnetism," by Professor Wartman, a paper dealing with the action of magnets upon polarized light, and with electrolytic subjects. 2. Professor

Mateucci read a paper entitled "Summary of Researches in Electro-Physiology," describing experiments proving that the development of electricity in living animals is a phenomenon appertaining to all organic tissues, and that it is a necessary consequence of the chemical processes of nutrition. Further, all experiments contradict the opinion of an electrical current existing in the nerves. 3. J. Bullar, M.D., read a paper on "The Identity of Certain Vital and Electro-magnetic Laws." 4. Professor Svanberg one on "A New Multiplying Condenser." 5. Mr. J. A. Brown discussed the "Results of Magnetic Observations at Makerstoun." 6. Mr. G. Fowler, "Magnetic Causation." 7. W. Petrie, one on "An Extensive Series of Magnetic Investigations," in which he discussed the process and material of the manufacture of magnets. 8. Rev. W. Scoresby, F.R.S., "On the Mode of Developing the Magnetic Condition." 9. J. Reade, M.D., "Experiments in Thermo-Electricity." 10. Prof. Mateucci, the "Electrization of Needles in Different Media." 11. Rev. J. T. Robinson, D.D., "On the Influence which finely-divided Platina exerts on the Electrodes of a Voltmeter;" and 12. J. P. Gassiot, F.R.S., on "The Electricity of Tension in the Voltaic Battery."

The last meeting was presided over by Dr. Charles William Siemens, F.R.S., who is one of the leading authorities on electrical science. In his inaugural address he says that electricity stands foremost among the exact sciences; he treats it accordingly, and devotes a large part of his address to its progress and present practical application. We would gladly publish what he there says but considerations of want of space, as well as the universal publication of it deters its entrance in our columns.

The papers which were read on Electricity at the last meeting are very interesting, but the growing trouble has been with these meetings that from year to year the papers read by members simply sum up what had appeared from their own pens in special magazines or in the papers published under the authority or direct supervision of various scientific bodies. The "memoirs" have too stale a flavor for the most part in this age, which demands early publicity for any important work.

It is not likely that this one will stand very high in the annals of the organization, either in new matter or suggestions, although the interest in it did not seem to be wanting.

EXAMINATION QUESTIONS IN PRACTICAL ELECTRICITY.

Questions set at the recent examinations of the City and Guilds of London Institute for the Advancement of Technical Education.

Instructions.

The candidate must confine himself to one grade only, the Ordinary or Honors, and must state at the top of his paper of answers which grade he has selected. He must not answer questions in more than one grade.

If he has already passed in this subject, either in the first division of the Elementary or in the Ad-

vanced Grade, he must select his questions from those of the Honors Grade.

The number of the question must be placed before the answer in the worked paper.

Three hours allowed for this paper.

Ordinary or Pass Grade.

1. Point out the difference between conduction and induction across air in a thunderstorm.
2. Describe the character, preservation, and erection of an ordinary wooden telegraph pole.
3. Describe and illustrate a Morse sounder circuit joined up for double current working.
4. Describe any telephone, and show how it is connected up for speaking.
5. Describe Grove's cell, how it is made up, and how it works.
6. Describe any form of telegraph which can be worked without a battery.
7. What is the block system, and how is it worked?
8. To whom are we indebted for the introduction of telegraphy into practical use, and when?
9. Show how aerial lines are insulated.
10. Why is the earth used so much to complete a circuit?

Honors Grade.

1. Describe the modern system of electrical measurement, and detail the different units in use.
2. Describe the full equipment of a testing table for testing ordinary land telegraphs.
3. Explain the tests for conductivity and insulation, and show how to measure the strength of received currents.
4. Describe Bell's telephone, and show how speech is reproduced at a distance by its agency.
5. What is duplex telegraphy, and how is it effected?
6. There have been several magnetic storms this year. To what are they due, and how do they affect telegraphs?
7. How is their disturbing influence on telegraphs remedied?
8. The conductor of an Atlantic cable broke inside its insulating sheath without making any earth whatever. How was the locality of the rupture determined?
9. It is required to measure the electromotive force and internal resistance of a battery of many cells. How would you do it?
10. What are the mechanical and electrical tests applied to iron wire to determine its quality?

ELECTRICAL INSTRUMENT MAKING.

Instructions.

The candidate must confine himself to one grade only, the Ordinary or Honors, and must state at the top of his paper of answers which grade he has selected. He must not answer questions in more than one grade.

This examination is for the purpose of ascertaining whether the candidate has intelligently noted the methods employed in the workshop in the construction of electrical apparatus, and whether he has endeavored to ascertain the scientific reasons for the processes followed.

The number of the question must be placed before the answer in the worked paper.

The candidate is supplied with a sheet of ruled squared paper.

Three hours allowed for this paper.

Ordinary or Pass Grade.

[Candidates are not expected to answer more than six questions, but more may be attempted.]

1. Describe in detail the construction of a perma-

nent magnet, mentioning the process of magnetizing least likely to produce consequent poles, and the reason of this. Give the approximate chemical constitution of the steel you would employ. From what parts of Europe is the best magnet-steel obtainable?

2. Describe the construction of a Jamin magnet, especially the mode employed for putting the component magnets into the iron shoe, so as not to weaken the magnets, and give the reason for the method followed.

3. Draw curves showing the distribution of magnetism along the edge of a bar magnet of rectangular section, as well as along the central line.

4. For making the cores of electro-magnets what is the best iron to be employed, and what is the detailed process to be employed to render the iron most effective? Compare the strength of an electro-magnet when wrought iron, cast iron or steel are respectively used for the core, other things remaining the same.

5. You are required to design an electro-magnet to record by the motion of its armature the exact moment of making and breaking an electric current. Explain very fully, with sketches, the size and shape of the electro-magnet and armature you would employ.

6. Explain shortly, giving sketches, the difference between (a) absolute, (b) sensitive, (c) dead beat, (d) astatic and (e) differential galvanometers. What are the various methods employed for rendering a galvanometer dead-beat, and which do you consider the best? Mention the full reasons for your answer. Describe with drawings the complete operation of winding and testing a differential galvanometer.

7. The deflection of the needle of a galvanometer is not, as a rule, proportional to the strength of the current. Explain various methods of ascertaining experimentally the connection between different currents and the deflections they respectively produce. Show clearly what is the least amount of apparatus you must employ for carrying out each method. In what way would it be best for a maker of a galvanometer to record, for the benefit of the purchaser, the law connecting deflection with current?

8. Compare the relative advantages and disadvantages of a Grove, Daniell and Menotti cell, and explain exactly in what cases you would employ each. How many Menotti cells, each having $7\frac{1}{2}$ ohms resistance, must be employed so that the battery has 11 volts electromotive force and 17 ohms internal resistance? What current in amperes will this battery send through a wire 490 ohms in resistance, with an electro magnet of 100 ohms resistance at its distant end? How will the total current be changed if a leak of 700 ohms be inserted in the middle of the line wire, and what will be the current now flowing through the distant electro magnet?

9. Give a drawing of a shunt box having a high insulation. Prove what should be the resistance of three shunts so that .1, .01 and .001 of the total current passes through a galvanometer of 6,000 ohms resistance. Describe the simplest method of testing with accuracy the coils of the shunt. What kind of wire would you use for the shunt's, how would you wind it, and where would you place it to diminish the temperature error as much as possible?

10. Describe, with sketches, the best form of Holtz's electrical machine with which you are acquainted. Explain clearly the principle of its action, and show exactly what is necessary in order that the machine may start at any time without a charge being given to it.

11. For what object is a condenser attached to the primary circuit of a Ruhmkoff coil? Show by

a sketch exactly how it must be attached to fulfil this object. If the opposite coatings of a condenser be attached to the ends of the secondary coil, what effect has this on the spark?

Honors Grade.

[Candidates are not expected to answer more than seven questions, but more may be attempted.]

1, 2, and 3. The same as in the pass examination.

4. What is the law connecting the strength of a straight electro-magnet with its length, the diameter of the core, the material composing the core, the number of turns of wire, and the current? Explain what are the limitations, and the reasons for such limitations, in the use of this formula. Compare the strength of an electro-magnet when wrought iron, cast iron and steel are respectively used for the core, other things remaining the same.

5. Define intensity of magnetization. What is about the maximum intensity of magnetization that can be practically given to a long, thin, hard steel bar?

6. What is your practical experience in the use of iron wire for electro-magnets? In what cases would you employ a compound electro-magnet, consisting of a number of concentrically-coiled iron tubes. Give your full reasons.

7. What is the best ratio for the diameter of the core of an electro-magnet compared with the diameter of the coil (1st) for weak currents, (2d) for strong currents? Prove your rule.

8. A horse shoe electro-magnet has two bobbins, each 3 inches long and $1\frac{1}{2}$ external diameter. If the diameter of the core is one-third of an inch, the resistance of the remainder of the circuit 500 ohms, and the resistance of a cubic inch of pure copper 0.63 microhms, what gauge of copper wire, having 95 per cent. of the conductivity of pure copper, would you wind on if the thickness of the silk were neglected? How exactly would you modify your answer in practice to allow for the insulating covering?

9. If the solid iron core in an electro-magnet be replaced with a hollow one, or with a hollow one fitted with an iron cap, what change is produced in the resultant magnetic force, (1st) at a point close to the end of the core; (2d) at a distant point?

10. Define an ohm, a volt, an ampere and a coulomb. You are required to make an ohm coil as accurately as possible. What difference exactly would you make between it and the standard ohm coil you possess, so as to allow for the best results of the most recent experiments on the error of the practical ohm? Explain how you would experimentally graduate a galvanometer so that the number of amperes corresponding with any deflection should be known. How would you practically arrange a galvanometer so that the same connection between amperes and degrees of deflection should apply for different positions of the instrument?

11. Explain shortly, giving sketches, the difference between (a) absolute, (b) sensitive, (c) dead-beat, (d) astatic, and (e) differential galvanometers. Give full drawings of a dead-beat galvanometer designed on what you consider the best principles.

12. A tangent galvanometer is one foot in diameter, and has two convolutions of wire. If the horizontal intensity of the earth's magnetic force is 0.1813 (C.G.S.), how many amperes are necessary to produce a deflection of 45 deg.? If the galvanometer has also a second coil of fifty convolutions, with a mean diameter of six inches, show exactly how, by means of a Daniell cell and a resistance box, you could check your previous result.

13. Describe in detail and give sketches of instru-

(Continued on page 200.)

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, October 20, 1882.

To all offices on Western Union lines:

The following changes which have been made since September 20, 1882, should be entered in the Tariff Book, and the list of New Offices given in the Journal of September 20, 1882, as they will not be republished.

Changes given in italics effect places to be found only in the list of new offices given in the Journal of September, 20, 1882.

REPRINTED FROM THE JOURNALS OF MARCH 1ST AND 20TH, 1882

GENERAL ORDER.

WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, February, 1882.

To all offices:

For the month of February, 1882, and thereafter until further orders, business with the offices of the Great North Western Telegraph Company will be reported separately from business with Western Union offices. Managers will therefore make out the usual check report showing business with Western Union offices only, and an additional check report showing business with the Great North Western offices. The additional report should be footed and signed independently of the regular report, and should be endorsed "G. N. W. Report" at the top of the printed heading on the face of the blank and at the top of the filing on the back. The totals should be entered under and added to the totals of the regular report to form grand totals to agree with the account current No. 4.

Daily receipts from the Great North Western business should be entered on the "Dr." side of account current as for "this" line, and in the report of "daily telegraph receipts" on blank No. 4 should be consolidated with the regular "this" line receipts.

Managers who receive a commission will be allowed the same per centage of Western Union receipts as heretofore, but it must be understood that of the "this" line receipts of the "G. N. W. report" but six-tenths are Western Union. If therefore, the amount of commission is to be ascertained, it should be computed first on the "this" line receipts of the Western Union report, and then on six-tenths of the "this" line receipts of the "G. N. W. report." Four tenths of the receipts of the "G. N. W. report" belong wholly to the Great North Western Company; nothing will be allowed from it for Western Union commissions.

Great North Western offices in Ontario and Quebec are indicated in the tariff book page IV, paragraph 10. Great North Western offices elsewhere are as follows:

| | | |
|--------------------|-----------------------|-----------------------|
| MAINE. | Milledosa | 3 Campbellton |
| 23 Bethel | McGregor | 3 Campbellton Sta. |
| 13 Bryants Pond | Neepawa | 3 Canaan |
| 14 Falmouth | Niverville | 3 Caracquette |
| 23 Gilead | Oak Lake | 3 Charlo |
| 20 Lewiston June'n | Ossawa | 3 Chatham |
| 20 Mechanics Falls | Otterburn | 3 Chatham June. |
| 14 New Gloucester | Portage La Prairie | 3 Clifton |
| 14 North Yarmouth | Portage La Prairie | 3 Chbl Branch |
| 20 Norway | Sta. | 3 Dalhousie |
| 10 Oxford | Rapid City | 3 Dalhousie Sta. |
| 20 Eo. Paris | Reaburn | 3 Grand Anse |
| 23 West Paris | Rosser | 3 Jacques River |
| 14 Yarmouth | Sewell | 3 Kent June |
| | Sidney | 3 Kingston |
| | Stowall | 3 Kouchibouguac |
| MANITOBA. | St Boniface June | 3 New Castle |
| Alexandria | Third and Fourth | 3 New Mills |
| Austin | Ridings | 3 Petit Rocher |
| Brandon | Westbourne | 3 Pokemouche |
| Broadview | West Lynne, Ck. | 3 Red Pine |
| Burnside | Emerson | 3 Richibucto |
| Chater | Winnipeg | 3 St. Peters |
| DeWinton or Car- | | 3 Shippegan |
| berry | NEW BRUNSWICK. | 3 Tracadie |
| D. minion City | 3 Barnaby River | 3 Weldford |
| Du Frost | 3 Bartibogue | |
| Emerson | 3 Bathurst | NEW HAMPSHIRE. |
| Emerson Sta. | 3 Bathurst Sta. | 23 Berlin Falls |
| End of Track | 3 Beaver Brook | 23 Gorham |
| Fort Gary | 3 Belldune | 23 Milan |
| Gladstone | 3 Berry's Mills | 23 No. Stratford |
| High Bluff | 3 Bridgetown | 23 Shelburne |
| Meadow Lea | 3 Bucoche | 23 Starkwater Sta. |

NEW YORK.

64 Adams
64 Adams Centre
39 Addison Junc'n
73 Alexandria Bay
63 Altona
56 Antwerp
44 Ausable Forks
63 Bangor
82 Belleville, Jefferson Co.
44 Black Brook
44 Bloomingdale
63 Bombay
63 Brasher Falls
64 Brownville
63 Brushton
63 Burke
44 Burlingame
56 Canton
82 Cape Vincent
64 Carthage
63 Champlain
63 Chateaugay
82 Chaumont
63 Chazy
44 Cheever
44 Cheever Ore Bed
63 Cherubusco
39 Chubb's Dock
44 Clayburg
73 Clayton
63 Clinton Mills
44 Clintonville, Clinton Co.
56 Colton
64 Constableville
64 Copenhaven
63 Crary's Mills
39 Crown Point
63 Dannemora
64 Deer River
64 DeKalb Junction
63 Dexter
39 Dresden, Wash'n Co.
56 East Constable
56 Edwards, St. Lawrence Co.
44 Elizabethht'n, Essex Co.
63 Ellenburg Depot
44 Essex
44 Evan's Mills
44 Ferrona

73 Fisher's Land'g
63 Forest
63 Ft. Covington
56 Gouverneur
64 Great Bend
73 Hammond, St. Lawrence Co.
56 Harrisville
63 Helena
82 Henderson
82 Henderson H'bor
56 Hermon
56 Heuvelton
63 Hogsburg
56 Hopkinton
39 Hulet's Landing
44 Keeseville
56 Knapps Sta.
64 Lacona
73 La Fargeville
56 Lawrence, St. Lawrence Co.
56 Lawrenceville, St. Lawrence Co.
82 Limerick
56 Lisbon Centre
44 Loon Lake House, Franklin Co.
64 Lowville
56 Madrid
56 Madrid Depot
63 Malone
64 Mannville
44 Martinsburg
63 Massena, St. Lawrence Co.
74 Mexico
44 Moffitsville
56 Moira
63 Mooer's Forks
63 Mooer's Junc'n
56 Morley
64 Natural Bridge
74 New Haven
56 Nicolville
63 Norfolk
56 Norwood
73 Ogdensburg
56 Omar, Jefferson Co.
56 Parishville
44 Paul Smith's
44 Peru, Clinton Co.
64 Philadelphia

86 Pierpont
64 Pierrepont Man'r
44 Plattsburg
73 Plessis
44 Port Henry
44 Port Kent
56 Potsdam
44 Prospect House, Saranac Lake
64 Pulaski
39 Putnam, Wash'n Co.
63 Raymondville
44 Redford
73 Redwood
56 Rensselaer Falls
64 Richland
56 Richville
39 Rogers Rock H'l
56 Russell
82 Sacketts Harbor
64 Sand Hill
44 Sandy Creek
44 Saranac
56 Shingle Creek
56 Stockholm Depot
73 Theresa
73 Thousand Island House
82 Three Mile Bay
39 Ticonderoga
63 Trout River
64 Turin
63 Waddington
64 Watertown
63 West Chazy
44 Westport Sta.
56 West Stockholm
44 Whallonsburg
44 Willsboro Sta.
63 Woods Falls
82 Woodville, Jefferson Co.

VERMONT.

30 East Franklin
30 East Rich'd Sta.
30 Island Pond
30 Lake
30 Newport Centre Station
30 North Troy
30 Norton Mills
30 West Berkshire

THOS. T. ECKERT, General Manager.

CHANGES.

ALABAMA.

306 Repton, reopened.

CALIFORNIA.

The words "Ok. Oakland," should be entered opposite the following places in Tariff Book: Berkeley, Berkeley West, Brooklyn, Deaf and Dumb Asylum, East Oakland, Mills Seminary, North Oakland, West Berkeley and West Oakland.

807 Orland now 789 Orland.

COLORADO.

Oedar Creek Divide closed.

Cimarron is in Square 628.

628 Hot Springs, closed.

McConnellville, changed to * Easton.

519 Twin Lakes, closed.

CONNECTICUT.

* West Hartford 15-0 telephone, Hartford.

* West Stratford, 15-0 telephone, Bridgeport.

32 Farmington, now * Farmington 15-0 telephone, Hartford.

DELAWARE.

60 Rehoboth, closed.

60 Woodside, closed.

67 Porters, closed.

FLORIDA.

* Lemo, closed.

* Sorrento, reopened.

All inquiries in regard to check errors with Lake City, Fla., should be addressed to J. G. Thornton, Supt., Jacksonville, Fla.

GEORGIA.

* Talbotton 25-2 (25-1 N. M. rate) Geneva.

IDAHO.

579 Ft. Hall, closed.

ILLINOIS.

338 Outler, now checked direct.

Albion and Keene are now W. Union offices, both in square 819. Belmont is now W. Union office, square 800.

INDIANA.

300 Chandler, reopened.

302 Falmouth, closed.

302 New Lisbon, closed.

373 Veloxia, closed.

302 Woodlawn, changed to 263 DeBoto.

306 Cedar Lake, closed.

Bird's Eye, Boston, Grandall, English and Milltown are now W. Union offices, all in square 282.

Georgetown, Floyd Co., is now W. Union office square 263. Oakland City and Winslow are now W. Union offices, both in square 800.

* Wayne City, closed.

INDIAN TERRITORY.

The "tariff for other lines" to Cantonment, Ft. Reno, Ft. Hill and Hill is now 25-1 Dodge City, Kas., or 50-2 San Antonio, Texas. Erase the route and rate via Denison, Texas.

IOWA.

417 Grainville, changed to 417 Harvard.

367 Hall should read 367 Hale.

KANSAS.

* Asherville now W. Union office, square 517.

465 No Robinson changed to 465 Robinson.

466 Perry should be 456 Perryville.

456 Pomeroy, closed.

446 LeLoup, closed.

KENTUCKY.

The following "other" line rates take effect November 1, 1882.

| | | | | |
|------------------|----|---------------------|-------|----------------|
| * Morehead, | 35 | Huntington, W. Va., | or 30 | Lexington, Ky. |
| * Mt. Sterling, | 40 | " | or 25 | " |
| * Olive Hill, | 30 | " | or | " |
| * Winchester, | 40 | " | or 25 | " |
| * Eastern Junc., | 25 | " | or 35 | " |
| * Kilgore, | 25 | " | or 35 | " |
| * Mt. Savage, | 25 | " | or 35 | " |
| * Olympia, | 35 | " | or 30 | " |
| * Pine Grove, | 40 | " | or 25 | " |

LOUISIANA.

* * St. Joseph now * St. Joseph, 25-2 (25-1 N. M.) Natchez, Miss.

* Fodoch, closed.

395 Maringuin, closed.

MARYLAND.

67 Black, now * Black, free by train, Lamona.

60 Woodland, closed.

MAINE.

16 Phillips and 16 Strong, reopened as telephone offices, 15 and 1 from Farmington.

MASSACHUSETTS.

21 Pigeon Cove, closed.

MEXICO.

To the following offices in Mexico the tariff for other lines from Galveston, Texas, is now 400 and 40.

Acapulco, Aguascalientes, Ahuacatlan, Ahualulco, Alamos, Allende (erape del Parral) Altata, Avino, Cerro Gordo, Chalchihuites, Chihuahua, (or 79-5 El Paso, Texas) Colima, (concordia, Copala, Cosala, Cuernavaca, Culiacan, Durango, Elota, Izatlan, Fresnillo, Hidalgo del Parral, Lagos, Manatlan, Mocorito, Masas, Nombre de Dios, Panuco, Potosi, Quelite, Quila, Rinconada, Rinconada Romos, Rio Florido, Rosales, Rosario, Salto, San Blas, San Ignacio, San Luis Potosi, San Marcos, San Martin, Texmelucan, Tepic, Tequila, Tuxtlan, Villah de Santiago, Zacamelo, Zapatlan and Zapotlanejo.

Guadalupe 410-45, San Juan de los Lagos 437-42, Santa Rosalia 400-41, Teul 450-42 and Zimapan 600-45 from Galveston, Texas.

MICHIGAN.

119 Amber, closed.

119 Filer City, Ok. Manistee.

230 Portmouth changed to 230 South Bay City.

127 Bay View, closed.

127 Mullet Lake, closed.

127 Topinabee, closed.

100 Wetsell, closed.

MINNESOTA.

886 Correll, closed.

870 East Henderson, Ok. Henderson.

884 Edna, changed to 884 Beltrami.

864 Thomson, re-opened.

Minnesota Transfer Station is in square 861.

MISSOURI.

448 Lamar should read 448 Lamar Sta.

389 Osage is in Cole Co.

Greenfield, now 25-2 So. Greenfield.

MONTANA.

* Stillwater is now W. Union office, square 861.

NEBRASKA.

* Marquette is now 30-2 York. Erase 55-4 Plattsmouth.

NEW HAMPSHIRE.

Bethlehem, Crawford House, Glen House, Maplewood Hotel, Mt. Washington, Mt. Pleasant House, and Profile House, closed.

20 Intervale, closed.

NEW JERSEY.

53 Cape May Point, now * Cape May Point 25-1 Philadelphia, Pa.

59 Clarksboro, erase "Ok. Woodbury."

53 Forest Grove, closed.

53 Cap e May Point now * Cape May Point 25-1 Philadelphia, Pa.

53 Iona, closed.

41 Palisades Mountain House, closed.

47 Seaside Park, closed.

53 Weymouth, closed.

47 Bay Head, closed.

53 Franklinville, closed.

53 Malaga, closed.

NEW MEXICO.

566 Cerrillos, changed to 566 Los Cerrillos.

NEW YORK.

40 Blue Store, closed.

46 Circleville, closed.

45 Cohoes Depot, Ok. Cohoes.

74 Durhamville, closed.

101 East Gainesville, closed.

48 Guymard, closed.

37 Lake Mahapee, summer office, should be erased from the Tariff Book.

46 Pond Eddy, closed.

57 Trenton Falls, closed.

101 Lakeville, closed.

NORTH CAROLINA.

184 Henry Sta., closed.

NOVA SCOTIA.

1 So. Sydney, Ok. Sydney.

OHIO.

233 Jones. P. O. Jones Sta.

169 Little Mountain, closed.

181 Rend's should read 181 Rendville.

192 Vinton is in Gallia Co.

* Conneaut Lake, closed.

PENNSYLVANIA.

140 American Transfer Sta., closed.

111 Babcock's Mill, closed.

113 Oresson Springs, closed.

66 East Port Carbon, Ok. Port Carbon.

111 Gilmore City, closed.

59 Gray's Ferry, Check "sent" business with Philadelphia, at rate of 15-1 from Philadelphia; check "received" business direct at the square or state rate.

59 Lasaretto, closed.

140 McClymond's Sta., Check Petrolia.

94 Mifflintown should read 94 Mifflin, Juniata Co., P. O. Paterson.

59 Mohrville, Ok. Leesport.

47 Meshaming Falls, Ok. Somerton.

59 Penillyn, Ok. North Wales.

59 Port Richmond tariff same as Philadelphia, Ok. Philadelphia.

57 Sayre should be added to the list of offices headed American Union Franks, and given in Journal Feb. 1, 1882.

66 Silver Brook, Schuylkill Co., closed.

181 Smith's Mills, closed.

66 Stanton, closed.

* Stoneham, now 131 Stoneham.

58 Taylorsville is in Lackawanna Co., and is now checked direct.

* Hammensburg should read * Harmonsburg.

140 Sakina Ok. Oil City, Erase "Ok. Petrolia."

151 Wilkinsburg, closed.

TEXAS.

* Belton, now W. Union office, square 603.

The "tariff for other lines" from Dodge City, Kas., and San Antonio, Tex. to the offices on the U. S. Military lines, in Texas, named below, is as follows:

| | Dodge City. | San Antonio. | | Dodge City. | San Antonio. |
|-------------|-------------|--------------|-----------------|-------------|--------------|
| Boerne, | 50-2 | 25-1 | Ft. Stockton, | 50-3 | 25-1 |
| Concho, | 50-2 | 25-1 | Fredericksburg, | 50-3 | 25-1 |
| Decatur, | 25-1 | 25-1 | Graham City, | 25-1 | 25-1 |
| Ft. Davis, | 50-2 | 25-1 | Jacksboro, | 25-1 | 25-1 |
| Ft. Elliot, | 25-1 | 50-2 | Henrietta, | 25-1 | 25-1 |

UTAH.

576 Camp Douglass, Ok. Salt Lake City.

VERMONT.

38 Highgate Springs, closed.

39 Lake Dunmore House, closed.

39 Sudbury, closed.

38 Congress Hall, Sheldon closed.

38 Magnum Bay, Ok. Johnsbury.

VIRGINIA.

142 Hot Springs, closed.

95 Fauquier White Sulphur Springs, closed.

* Rawley Springs, closed.

142 Rockbridge Arum Springs, closed.
 • Tunstall's, now 20-3, Richmond.
 • Slattery, closed.

WEST VIRGINIA.

163 Sweet Springs, closed.
 • Winifrede June., 30 2 Huntington, W. Va., or Greenbrier W. Sul. Springs. Erase "N.M."

On and after November 1, 1882, the following will be the "other" line rates from Greenbrier, White Sulphur Springs and Huntington, W. Va. "Night Messages" will not be accepted to or from the places named after Nov. 1. Erase letters (N.M.) in Tariff Book:

| | | | | |
|---|---|---|-------|---|
| Barbourville 30 Greenbrier W. S. Springs, or 25 Huntington. | | | | |
| Alderson 25 | " | " | or 40 | " |
| Brownstown 30 | " | " | or 25 | " |
| Caldwell 25 | " | " | or 40 | " |
| Charleston 30 | " | " | or 25 | " |
| Coalburg 30 | " | " | or 30 | " |
| Cotton Hill 30 | " | " | or 30 | " |
| Cannelton 30 | " | " | or 35 | " |
| Fire Creek 25 | " | " | or 40 | " |
| Ft. Spring 25 | " | " | or 35 | " |
| Hinton 25 | " | " | or 30 | " |
| Hawks Nest 30 | " | " | or 25 | " |
| Hurricane 30 | " | " | or 25 | " |
| Gaysandotte 30 | " | " | or 30 | " |
| Kanawha R. 30 | " | " | or 40 | " |
| Lowell 25 | " | " | or 25 | " |
| Milton 30 | " | " | or 35 | " |
| New Richm'd 30 | " | " | or 35 | " |
| Nuttallburg 30 | " | " | or 30 | " |
| Paint Creek 30 | " | " | or 35 | " |
| Quinnimont 30 | " | " | or 40 | " |
| Roncoverte 25 | " | " | or 40 | " |
| St. Albans 30 | " | " | or 25 | " |
| Scott 30 | " | " | or 25 | " |
| Stone Cliff 30 | " | " | or 35 | " |
| Sewall 30 | " | " | or 35 | " |

WISCONSIN.

• Alma, closed.
 • Beef Blough, closed.
 306 Lakeside, closed.
 642 Mehan, closed.

WYOMING.

567 Big Sandy, closed.

SHEET L. OFFICES.

Will add Phoenixville and Pottstown, Pa., to Sheet L, and charge same rate thereto as to Norristown, Pa.

ATLANTIC CABLE.

The rate from London to Valparaiso and all places in Chili, is now \$3.57 per word.

The cable between Amoy and Shanghai, repaired.

Messages for Aden, for So. Africa, and for the Far East are now sent "Via Suez," at the rates printed in the Tariff Book.

All routes to Egypt now restored at old rates; and messages written in secret language again accepted.

New telegraph stations have been opened at Mecca and Djedda in Arabia. Rate from London 80 cents per word. Messages should be sent "Via France."

Cable between Amoy and Hong Kong repaired.

CENTRAL AND SOUTH AMERICAN CABLES.

The lines and cables of the Central and South American Telegraph Co. are now working as far as Lima, Callao and Payta in Peru. For rates, &c., see JOURNAL August 20th and September 20th, 1882.

The Valparaiso rate given as \$3.08 per word in JOURNAL of August 20, 1882, should be \$3.07 per word.

Add Limon to the list of places in Costa Rica, published in JOURNAL of August 20, 1882.

The following are new stations in Peru, on the Central and South American Telegraph Co.'s lines:

Chiola,
 Chancay,
 Chosica,
 Huacho,
 Matucana,
 San Bartolome,
 San Mateo,
 Santa Clara,
 Supe,
 Surco,
 Chorillas, 32 cents for 10 words and 32 cents for each additional 10, or fraction of 10 words, more than the rate to Lima.

CUBA CABLE.

The cables between St. Thomas and St. Kitts and between Guadalupe and Dominica are repaired.

Communication via the cable between Grenada and St. Vincent, interrupted.

The reduction of 73 cents per word to Panama on account of the failure of the Kingston-Colon Cable, applies only on messages sent via Havana, Cuba. The rate to Panama via Galveston, Texas, is given in JOURNAL of August 20, 1882.

NEW OFFICES.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

* • Mobile mail time Book.

ARIZONA.

641 Calabasas.

441 Bierno. 392 Hazen. 440 Mountainburg.

CALIFORNIA.

789 Corning.

COLORADO.

628 Cerro. 628 Delta. 628 Montrose.

* Easton (N.M.) 40 3 Denver.

DAKOTA.

884 Ardook. 895 Larimore. 895 Ojata.

926 Bramhall. 8-4 Mauvel. 920 Rudolph.

889 Grafton. 889 Minto. 896 Walcott.

FLORIDA.

* Sumterville, 75 5 Lake City.

GEORGIA.

217 James Sta.

* Dallas 30 2 Atlanta.

* Ga. Pacific June. 25 2 Atlanta.

* Indian Springs 40 3 Atlanta.

* James Ferry 40 3 Atlanta.

* Locust Grove 30 2 Atlanta.

* McDonough 25 2 Atlanta.

* Powder Springs 25 2 Atlanta.

* Rockmart 40 3 Atlanta.

* Stockbridge 25 2 Atlanta.

IDAHO.

578 Montpelier.

ILLINOIS.

346 Nelson. 319 Wayne City.

INDIANA.

262 De Soto. 262 Leonard. 272 Stinesville.

INDIAN TERRITORY.

477 Tulsa.

IOWA.

435 Dana. 435 Rockwell City. 425 Rodman.

417 Harvard.

* Aspinwall 40 3 Marion, or 25 2 Council Bluffs.

* Astor 40 3 " " 25 2 " "

* Atkins 25 2 " " 40 3 " "

* Bagley 40 3 " " 30 2 " "

* Bayard 40 3 " " 25 2 " "

* Cambridge 30 2 " " 40 3 " "

* Collins 25 2 " " 40 3 " "

* Coon Rapids 40 3 " " 25 2 " "

* Covington 25 2 " " 40 3 " "

* Dedham 40 3 " " 25 2 " "

* DeLancey 40 3 " " 25 2 " "

* Dunbar 25 2 " " 40 3 " "

* Elberon 25 2 " " 40 3 " "

* Ferguson 25 2 " " 40 3 " "

* Gladstone 25 2 " " 40 3 " "

* Haverhill 25 2 " " 40 3 " "

* Huxley 30 2 " " 40 3 " "

* Jamaica 25 2 " " 30 2 " "

* Keystone 25 2 " " 40 3 " "

* Louisa 25 2 " " 40 3 " "

* Madrid 30 2 " " 40 3 " "

* Marthan 40 3 " " 25 2 " "

* Maxwell 25 2 " " 40 3 " "

* Melbourne 25 2 " " 40 3 " "

* Newhall 25 2 " " 40 3 " "

* Panama 40 3 " " 25 2 " "

* Persia 40 3 " " 25 2 " "

* Potter 25 2 " " 40 3 " "

* Portsmouth 40 3 " " 25 2 " "

* Rhodes 25 2 " " 40 3 " "

* Templeton 40 3 " " 25 2 " "

* Underwood 40 3 " " 25 2 " "

* Van Horne 25 2 " " 40 3 " "

* Vining 25 2 " " 40 3 " "

* Woodward 30 2 " " 40 3 " "

* Warrack 40 3 " " 25 2 " "

* Yorkshire 40 3 " " 25 2 " "

KANSAS.

514 Assaria. 456 Connors. 455 Robinson.

514 Cedar Grove. 507 Green.

KENTUCKY.

224 East Bernstadt. 224 London. 254 Rileys.

* Ecunapia Springs 10 1 telephone, Vanceburg.

* Aden 25 2 Huntington, W Va., or 35 2 Lexington.

* Denton 25 2 " " or 35 2 " "

* Farmer 35 2 " " or 30 2 " "

* Meads 25 2 " " or 35 2 " "

LOUISIANA.

404 Fordoche. 424 Irion. 424 Morrows.

* Atherton 50 4 Tallulah.

* Waterproof 25 2 (25 1 N. M.) Natches, Miss.

MAINE.

* Green's Landing, Deer Isle, 25 2 Ellsworth.

* Greenvale, 25 2 telephone, Farmington.

* Madrid 20 2 telephone, Farmington.

* Rangeley 25 2 telephone, Farmington.

MASSACHUSETTS.

25 East Medway

* Acushnet 10 0 telephone, New Bedford.

* Onset Bay 15 0 telephone, New Bedford.

* Rochester 15 0 telephone, New Bedford.

MEXICO.

Bustamante 37 3 Laredo, Texas.

Guadalupe (Zacatecas) 450 43 Galveston, Tex.

Jaipa 400 43 Galveston, Tex.
 The tariff for "other" lines from Galveston, Texas, to the following is 400-40:

Aramberri.
 Ariz.
 Ayotla.
 Buena Vista (Distrito Federal).
 Buena Vista (Honora).
 Dondomingullo.
 Fuerte.
 Galeana.
 Guadalupe de los Reyes.
 Huasteco.
 Jimenez.
 Juchitan.
 Lerdo Villa.
 Mazatepec.
 Michuastian.
 Padilla.
 Potos.
 Paso del Tusaio.
 Parris.
 Peotillos.
 San Pedro del la Colonia.
 San Fernando de Frescas.
 San Felipe del Obraje del I rogrease.
 San Juan o de las Llanas.
 San Marcos de Colonia.
 Taretan.
 Tacambaro.
 Tlatlanquitepec.
 Uruapam.
 Villa Garcia.
 Villa del Reyes.
 Villa Juarez.
 Valle de San Francisco.
 Zaragoza.
 Zacapaxtla.

MICHIGAN.

251 Nottawa 230 South Bay City.
 127 Pellsaville. 127 Sweetland.
 • Hendria, 40 3 Marquette.

MINNESOTA.

884 Beltrami. 865 Oneco. 890 Tenney.
 860 Kimberly.

MISSOURI.

408 Millard.
 • Lamar 10 1 telephone, Lamar Sta.
 • North Greenfield, 25 2 South Greenfield.
 • Sumner, 25 2 Unionville.

MONTANA.

956 Allard 960 Pompeys Pillar 961 Park City.
 960 Huntley.

NEBRASKA.

474 Berlin. 519 North Loup.
 474 Hickman. 927 Thacher.

NEW HAMPSHIRE.

17 Eye Beach Cable Sta.

NEW JERSEY.

41 Grovestend, Ok East Orange.

NEW MEXICO.

566 Los Cerrillos.

NEW YORK.

46 Mongaup, 101 Silver Lake June.
 • Brookfield, 15 1 North Brookfield.
 • Greenwood, Steuben Co., 10 1 telephone, Canisteo.
 • Monterey 10 1 telephone, Leaver Dams.
 • Rexville 15 1 telephone, Canisteo.

NORTH CAROLINA.

116 Chadbourne. 184 Old Fort.

OHIO.

211 Curtice. 180 Earlville. 170 Sandyville
 242 Centerville. 242 Lytle. 170 Sparta.
 242 Dodd. 170 No. Industry. 169 Washingtonville.
 • Cincinnati Race Course 25 2 Cincinnati.

OREGON.

804 Latham.

PENNSYLVANIA.

130 Anchor. 150 East New Castle. 111 Boffe.
 130 Byrums. 151 McKean Farm 180 Vandergrift.
 161 Coal Center. Ok.

California.
 • Lelsenring, 25 2 Connellville.
 • • Taylorsville, Bucks Co., free. Washington Crossing, N. J.

TENNESSEE.

194 Limestone

TEXAS.

490 Berlett.
 • Bertram, 40 3 Austin.
 • Wichita Falls, (N. M.) 40 3 Ft. Worth.

VERMONT.

36 South Shaftsbury.

• Randolph Centre, 10 1 telephone, West Randolph.

VIRGINIA.

123 Stewart's Lrift.

WASHINGTON TERRITORY.

794 Chehalis 794 Winlock.

WISCONSIN.

335 Fuller.
 • Delafield 10 1 telephone, Nashotah.
 • Duck Creek, 15 0 telephone, Green Bay.
 • Ellistville 20 0 telephone, "
 • • ew Franklin, 15 0 telephone, "
 • Ironton, 10 1 telephone, "
 • Rochester, 10 1 telephone, "
 • Spring Prairie 10 1 telephone, Springfield.
 • Waterford, 10 1 telephone, Burlington.

WYOMING.

548 Archer.

NORVIN GREEN, President.

TRANSFER SERVICE.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, Oct. 16, 1882.

To all Transfer Agents and Offices:

The transfer service has been temporarily discontinued at Marquette, Mich.

Bel Air, Md., and Laredo, Tex., have been added to the list of transfer offices in Class C, and assigned, the former to C. Jamieson's, and the latter to L. C. Baker's district.

On Nov. 1, 1882, Mt. Clemens, Mich., will be added to the list of transfer offices in Class C and assigned to E. P. Wright's district.

Managers will correct their lists accordingly.

NORVIN GREEN,
President.

EXAMINATION IN PRACTICAL ELECTRICITY.

(Continued from page 197.)

ments for measuring large currents and large electromotive forces—(1st) when the currents and electromotive forces are continuous, (2d) when they are rapidly reversed. Compare the advantages and disadvantages of the various forms of instruments.

14. What is an electrometer? Give the detailed construction of some sensitive one, with sketches of the various parts of the instrument.

15. Describe the theory and practical construction of a "constant current shunt;" that is, one which shunts the current passing through the galvanometer without altering the total current flowing in the circuit. Give numerical examples.

16. What is an "artificial submarine cable?" How exactly is it made, and what is its use?

17. Why exactly is there practically no spark between the terminals of a Ruhmkorff coil on making the primary circuit, although a bright spark occurs on breaking? The terminals of a secondary coil are joined together so that the circuit is complete, and the primary circuit is first made and then broken. Compare the total quantity of electricity which passes through the secondary coil in the two cases.

ANNUAL MEETING AMERICAN DISTRICT TELEGRAPH CO.

At the annual meeting of the stockholders of the American District Telegraph Company, held at the office of the Company, No. 8 Dey street, New York, Thursday, October 19th, at 12 noon, the following directors were elected for the ensuing year:

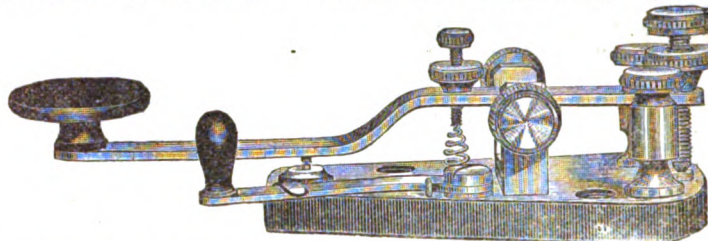
Thomas C. Platt.
John F. Patterson.
Thomas T. Eckert.
Chauncey M. Depew.
A. B. Johnson.
Jay Gould.
David H. Bates.
William F. Drake.
F. B. Wallace.
W. C. Humstone.
D. N. Crouse.
Henry K. Sheldon.
Charles A. Tinker.

The Board of Directors met at 3 o'clock, P. M., and elected the following officers of the Company to serve for the ensuing year:

President—Thomas T. Eckert.
Vice-Presidents—D. H. Bates, William F. Drake.
Secretary and Treasurer—S. S. Shriver.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

PARTRICK & CARTER'S Telegraphic Specialties. PERFECTION AT LAST! The Acme Steel Lever Key.



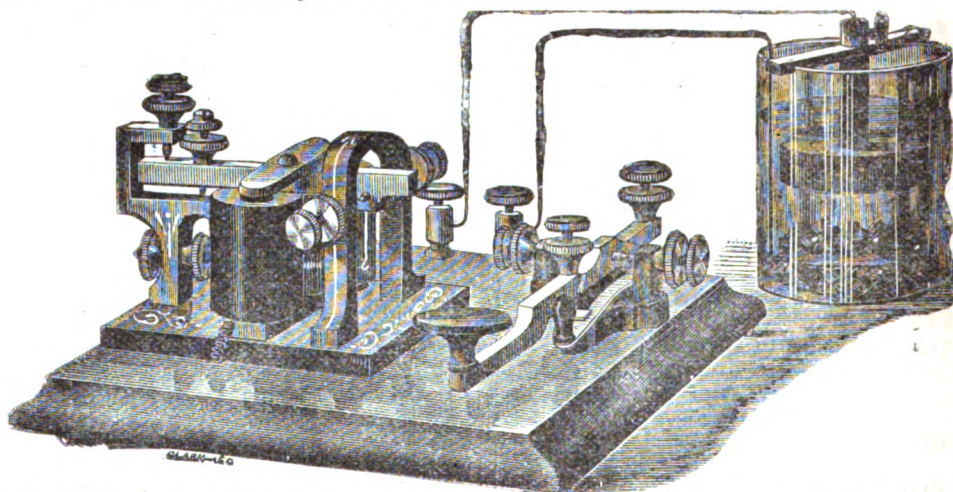
Price, by mail, to all parts of the United States and Canada, \$3.00.

For beauty of design, lightness, easy working, durability, and for fast sending, surpasses all other keys ever made. This key has hard rubber base, with top connections, and is entirely nickel-plated, and has received the indorsement of hundreds of operators throughout the country as being the "perfection of all keys." Since the introduction of the "Acme" key every mail brings fresh evidences that the "Acme" is destined to be the most popular key ever placed before the telegraphic profession.

The New Giant Sounder Perfected. Price, \$5 by mail. Patented Feb. 16, 1875, and the only patent ever granted embodying the principle contained in the Giant Sounder, and which is absolutely owned and controlled by us. Buy from us and you will get the original.

The Champion Lightning Arrester and Cut-Out. Price, \$1.25 by mail. The Lightning Arrester, Cut Out and Ground Switch combined, of which we are the originators, has been extensively copied and imitated, BUT NEVER EQUALLED.

Premium Learners' Apparatus.
ONLY \$5.
Not The Cheapest, But Guaranteed The Best.



THE PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER PERFECTED," and the "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Callaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5, when the money accompanies the order.

These Instruments are the exact size and form of those upon which we received the highest award at the late Centennial Exhibition over all competitors. Everything reliable, and so guaranteed, or money refunded. Our Book of Instruction contains full and explicit information as to setting up the battery, running of wires, &c.

| Price, Complete Outfit..... | Money in advance | \$5.00 |
|--|------------------|--------|
| " Instrument, without Battery..... | " | 4.20 |
| " " wound with finer wires for lines of 1 to 15 miles..... | " | 5.00 |
| " Cell of Battery, Complete..... | " | .80 |
| " Premium Sounder, Separate Base..... | " | 2.50 |
| " Premium Key..... | " | 1.75 |
| " Premium Learners' Instrument, Key and Sounder entirely Nickel-plated, without Battery..... | " | 5.20 |
| " Complete Nickel-plated Instrument, with Battery and Outfit..... | " | 6.00 |
| " " Sounder, Separate Base..... | " | 3.25 |
| " " " Key..... | " | 2.00 |

Instruments without Battery, sent by mail, 55 cents extra.

Battery Jars cannot be sent by mail.

All orders will receive our prompt and careful attention. To prevent delay in shipment full shipping instructions, with town, county and State, should be given. Remittances should be made by P. O. money order, registered letter, draft or express, which will insure safe delivery. Send for catalogues and circulars before purchasing elsewhere.

PARTRICK & CARTER,
Manufacturers of Telegraphic Instruments and Supplies,
114 South Second Street, Philadelphia, Pa.

A GREAT OFFER.

To Superintendents, Managers, Purchasing Agents
and others having on hand

Worn Out, Damaged or Useless Morse Keys,

We will, until further notice, furnish our

New Steel Lever Keys

in exchange for all old keys for a cash difference of \$1.66 each. This price applies to any number of keys, no matter in what condition the old ones may be. They must be delivered to us, in packages plainly marked KEYS, with all charges PREPAID, and remittance should accompany the orders, except from Superintendents and Purchasing Agents of well-known Companies.

Now is the time, while the offer holds good, to get together all of your

Used-up and "Bad" Keys

and exchange them for splendid New Ones. See description and advertisement of Steel Lever Key. Send for circular.

J. H. BUNNELL & CO.,

112 Liberty Street, N. Y.

FREE!

Complete Instruction in Telegraphy

If you wish to know all about learning Telegraphy, constructing and operating Short Lines of Telegraph, &c., send your address, by postal card or letter, and get J. H. Bunnell & Co.'s Manual of Instruction for Learners of Telegraphy, latest edition, which we will send

FREE OF CHARGE,

to all who apply, by mail or otherwise.

It is the plainest and best book of instruction in Telegraphy ever published, being fully complete in description, explanation and illustrations.

J. H. Bunnell & Co.,

112 Liberty Street, N. Y.

PROPOSALS FOR BLUE VITRIOL.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock noon, Monday, November 6th, 1882, for six months' supply of Blue Vitriol, to be a prime article and free from dust and powder. About 35,000 pounds per month to be delivered at our Supply Department in New York, and about 75,000 pounds to be delivered at our Supply Department in Chicago. No charge to be made for freight cartage or package. (The quantities named are only estimates, and the amounts required may be more or less than those given.)

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the first day of December, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Co. may require the goods contracted for.

Bills to be paid between the 15th and 25th of each month following the deliveries.

The right is reserved to reject any and all bids, or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Proposals should be sealed and addressed to the undersigned and endorsed,

"PROPOSALS FOR BLUE VITRIOL."

WM. HUNTER, Sup't Supplies.

New York, October 10th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR COAL

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock noon, Monday, November 6th, 1882, for 1,000 gross tons "Old Company's" Lehigh Nut Coal, to be delivered, as required, at the rate of about 150 tons per month, the first delivery to be made about the 15th day of November, 1882.

The coal to be delivered and stored in the vaults corner Broadway and Dey Street, before 9 A. M. and after 5 P. M.

A cargo of 150 to 175 tons may be delivered at one time, if more convenient for the contractor, or it may be delivered in small quantities.

If delivered by cargo, a bill of lading must be attached to the invoice, showing it to be "Old Company's" Lehigh.

A certificate, sworn to by a weigher, that the weights are correct, must accompany all invoices.

Proposals for any other than "Old Company's" Lehigh will not be considered.

Bills to be paid between the 15th and 25th of the month following the deliveries. The right is reserved to reject any and all bids, or to accept any one which may seem for the best interest of the Company.

The party whose tender is accepted may, at the option of the Company, be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Terms should be sealed and addressed to undersigned, endorsed

"PROPOSALS FOR COAL."

WM. HUNTER, Sup't Supplies.

New York, October 10th, 1882

KERITE INSULATED

TELEGRAPH WIRES AND CABLES.

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession.

THE

DURABLE QUALITIES OF KERITE

RECOMMEND IT AS THE

CHEAPEST AND MOST ECONOMICAL

insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES.

of any number of conductors or size of insulation, furnished at short notice.

INSULATED WIRE

of all sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

For further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

J. B. HOTCHKISS, General Agent.

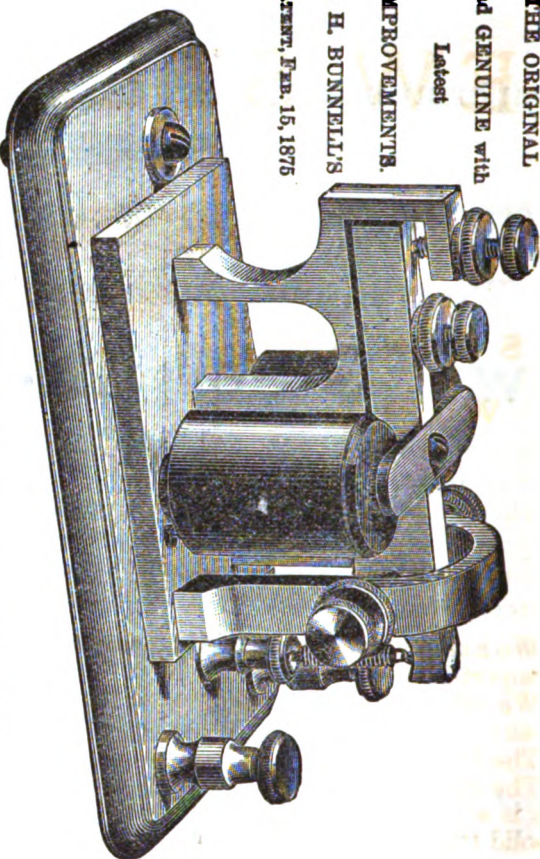
Another Great Reduction in Prices !

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS.

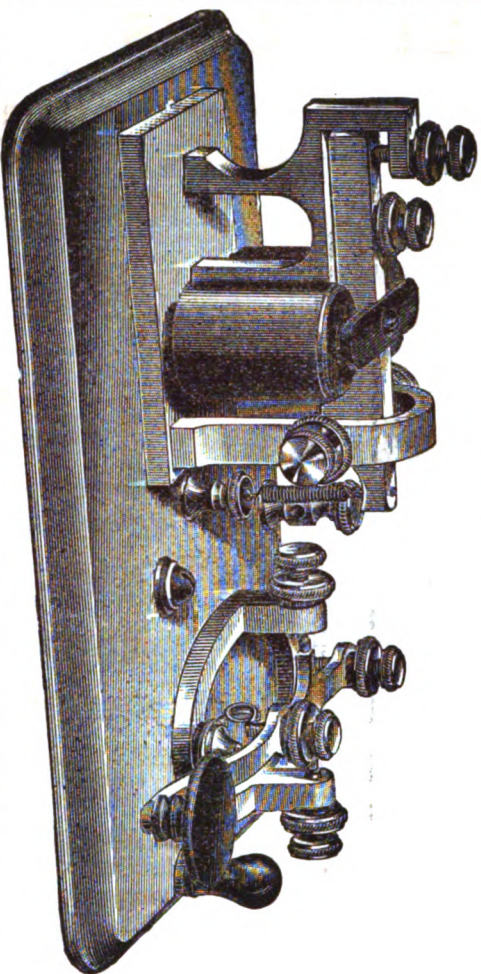
J. H. BUNNELL'S

PATENT, FEB. 15, 1875



THE GIANT SOUNDER—UNEQUALLED! \$4.00.

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$4.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



GIANT SOUNDER, (30 OHMS RESISTANCE) AND STEEL LEVER KEY.

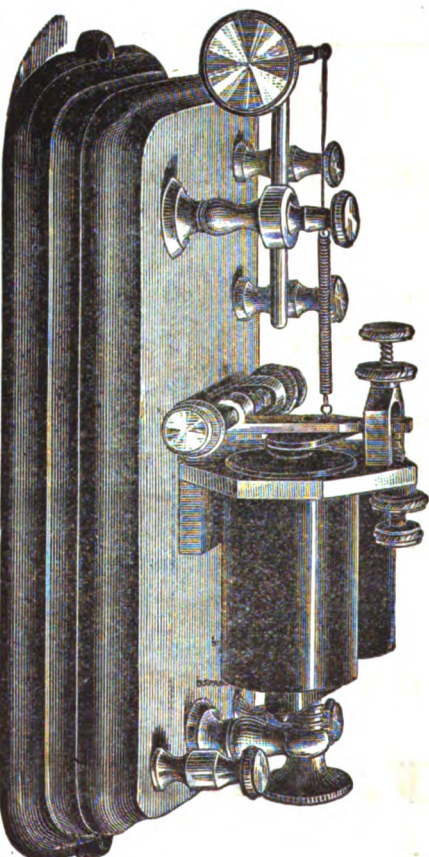
COMBINATION SET: \$7.50.

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 30 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$7.50, carefully boxed and sent by mail, prepaid, to any part of the United States.

All of these prices subject to liberal discount on orders in quantity.

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.

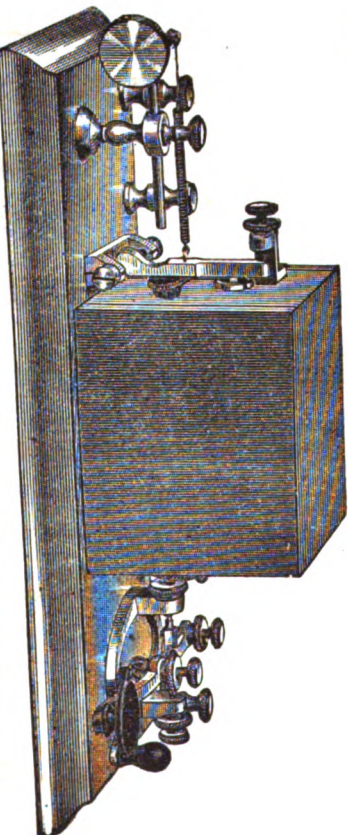
\$7.50.



FIRST CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Surbase, Extension Adjustment. Price, \$7.50, f

\$11.00.



BOX SOUNDING RELAY AND STEEL LEVER KEY.

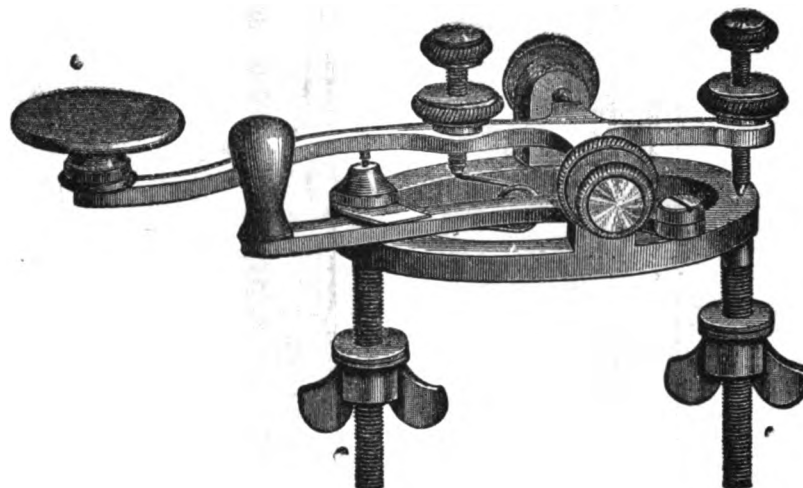
COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without local sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$11.00; without Key, \$8.50.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:

The Lever is *only one-half the weight* of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

Our Steel Lever Solid Trunnion Key

is now well known throughout the United States and Canadas as being the most satisfactory, durable and perfect key for Morse Telegraphing.

Its great popularity since its first introduction has caused many attempts to produce a key having at least equal merit. But, after two years' trial in thousands of different places, it still remains

“A Number 1,” Ahead of all,

while its competitors drop out and cease to be heard from.

Various absurd contrivances, more like Ticket Punches than Telegraph Keys continue to be put forward as being equal or better keys, but we would say to all who wish to possess a perfect instrument that

“The Bunnell Steel Lever Key”

is beyond all comparison,

THE BEST.

J. H. BUNNELL & CO.,

FIRST-CLASS TELEGRAPH INSTRUMENTS & MATERIALS OF EVERY DESCRIPTION,

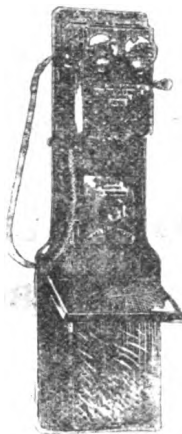
112 Liberty Street, New York.

CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1856.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.

Magneto Crank and Push Button Call Bells, Electric Bells,
District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS,

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

GEO. WASHINGTON, JR., Pres. ROBERT PITCAIRN, Treasurer.
O. H. JACKSON, Vice Pres't and Gen'l Manager
JAMES T. BOWARD, Secretary. HENRY SWYDEN, General Agent,

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
sole Owners and Manufacturers of the only practically suc-
cessful

**SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.**

Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Elec-
tricity,

Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.

Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnish-
ed upon application.

OFFICE AND WORKS:

Corner Fayette Street, Garrison Alley and Duquesne Way

DIVIDEND No. 61.

THE WESTERN UNION TELEGRAPH COMPANY, }
NEW YORK, September 12, 1882. }

THE Board of Directors have declared a quarterly
dividend of one and one half per cent. upon the
capital stock of this company, from the net earnings
of the three months ending September 30th instant,
payable at the office of the Treasurer on and after
the 16th day of October next, to shareholders of re-
cord on the 20th of September instant.

The transfer books will be closed at 3 o'clock on
the afternoon of September 20th instant, and opened
on the morning of the 17th of October next.

R. H. ROCHESTER, Treasurer.

Operators' Cramps cured by

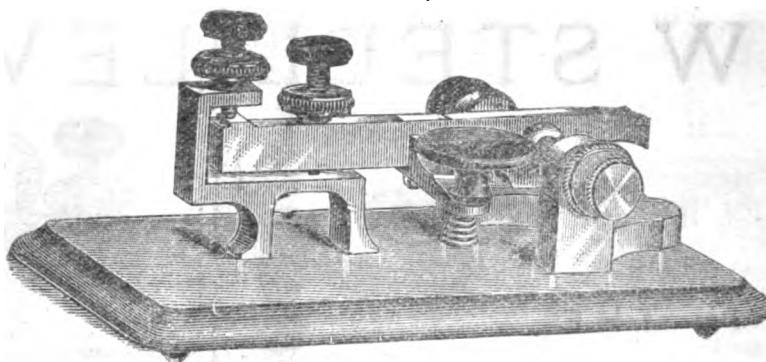
**LITTLE GIANT
FRENCH BATTERY**

Relieves Rheumatism
and all Nervous Com-
plaints. Supersedes all
others. Send for circular.

C. E. JONES & BRO.
Cincinnati, Ohio.

NEW MECHANICAL TELEGRAPH INSTRUMENT.

PATENTED APRIL 4, 1882.

**COMBINED KEY AND SOUNDER.**

NO BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER
For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is always ready for use.

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or register-
ed letter.

J. H. BUNNELL & CO., Telegraph and Telephone Supplies,
112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

ILLUSTRATED CATALOGUES OF MAY, 1882?

If not, send your address by postal card or letter and you will get one by return mail
It contains Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instru-
ments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.**J. H. BUNNELL & CO., 112 Liberty Street, New York.**

The Works of the Jno. A. ROEBLING'S SONS CO., at Trenton, N. J., have facilities for producing large quantities of Telegraph
Wire on short notice. The Belgian system of rolling long lengths of wire rods, and improved methods of galvanizing, were
first introduced in the United States at these works. It insures the production of wire with few joints, and a thick coating
of zinc.

Western Electric Company, CHICAGO. NEW YORK. INDIANAPOLIS.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES,

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANSON STAGER, *President.*ENOS M. BARTON, *V.-President.*

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE. |
|---|--------|--------|
| I—Complete Set of Catalogues..... | 296 | 20c. |
| II—Telegraph Instruments and Supplies..... | 64 | 6c. |
| IV—Insulated Wire (included in II) | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 52 | 5c. |
| VI—Electro-Medical Apparatus..... | 52 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 52 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 13 | 5c. |
| XI—Magnets for Mills..... | 20 | 5c. |
| Mr Wm. Thomson's Nautical Instruments.... | 24 | 5c. |

THE WESTERN ELECTRIC COMPANY,

62-68 NEW CHURCH STREET,

NEW YORK.

MANUFACTURERS

OF

ELECTRICAL INSTRUMENTS.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FIBERED

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

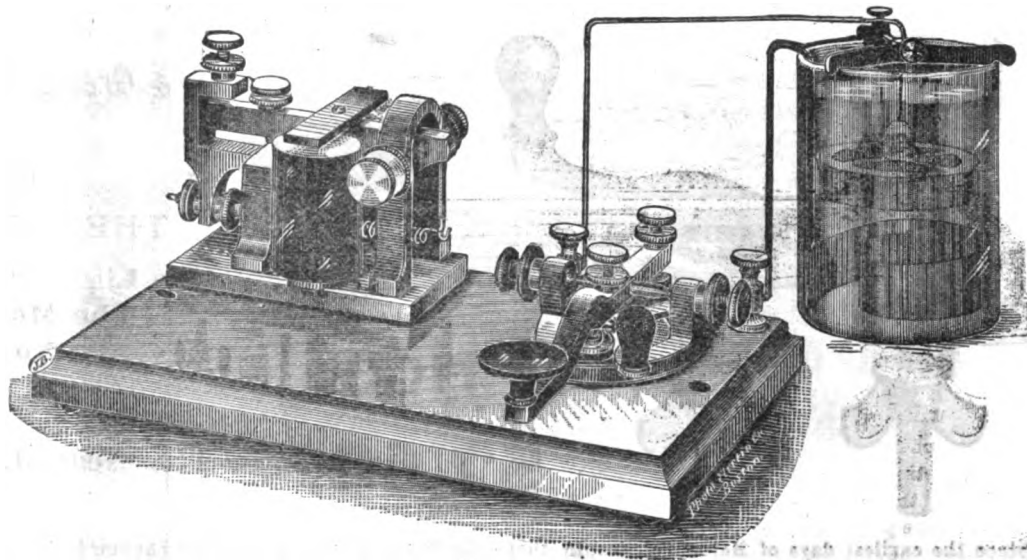
LEAD-ENCASED WIRE, CABLES, ETC.

OFFICE AND FACTORY: 67 STEWART STREET,

PROVIDENCE, R. I.

W. H. SAWYER, *Electrician and Sup'l.*

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



Price for the Complete "Gem" Learners' Outfit. \$3.75.

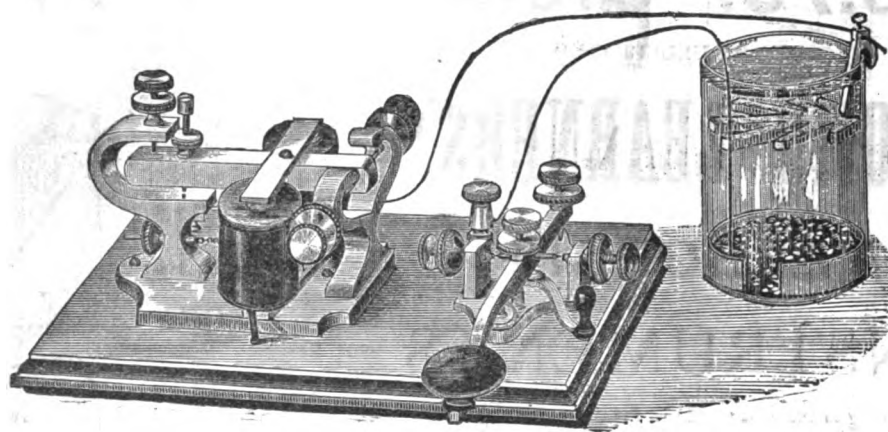
Consisting of the above large sized Sounder and Key, a large Cell of Callaud Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument that has nicely finished BRASS Sounder and Key Lever, with perfect adjustments for both.*

| | | | |
|---|--------|--|------|
| Price for Complete Outfit..... | \$3.75 | Price for Instrument alone, by mail, post-paid, \$3.60 | |
| “ Instrument alone..... | 3.06 | “ Instrument alone, for lines 1 to 15 miles..... | 3.60 |
| “ the whole outfit (except Glass Jar), with Key and Sounder separate, by mail, post-paid..... | 4.32 | “ Instrument alone, for lines 1 to 15 miles, by mail, post paid..... | 4.05 |

Send for Circular.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,
No. 30 Hanover Street, Boston, Mass.



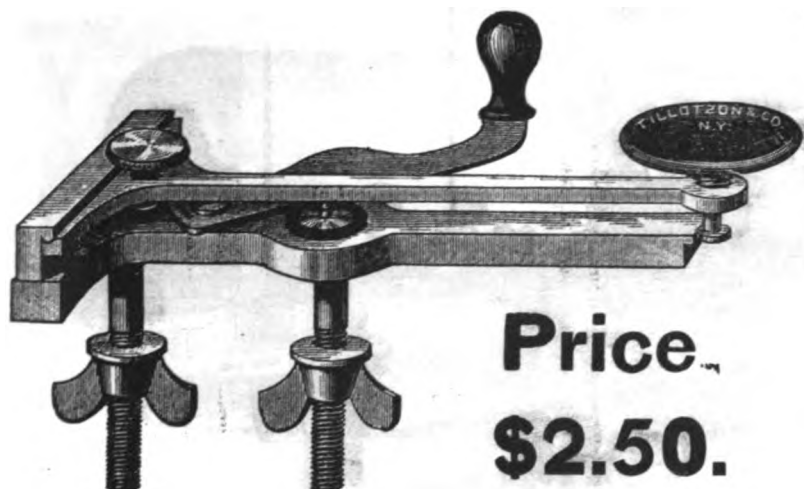
No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of Sounder, Key, either on 1 base or separate, 5x7, Callaud Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent C. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

This Key has Pure Platinum Points.

A. B. LYMAN, 36 South Water St., Cleveland, O.

THE "VICTOR" TELEGRAPH KEY.



**Price
\$2.50.**

PATENT APPLIED FOR.

*The Greatest Improvement in Telegraph Keys
ever made.*

THE EASIEST WORKING.

THE MOST POSITIVE CONTACT.

The Lightest Lever.

The Most Perfect in Construction.

No Trunnion Connections.

No Side Motion to Lever.

No Back Adjusting Screw.

**The Neatest, Nicest, Handiest and Best Key
in the World.**

Since the earliest days of Morse-Telegraphy there has been little or no radical change in Telegraph Keys until the invention of the Victor Key.

Telegraphers who take hold of the "Victor" Key, will at once notice that there are but two points of adjustment to regulate. These are the play of the lever and the stiffness of the spring. There are no loose trunnions to tighten up, and no tight trunnions to loosen. The lever can never move to one side or the other; and the point can never be worn into wedge shape. The play of the lever must of necessity be directly up and down, without side motion; and consequently the points must always strike fairly and squarely. The imperfect trunnion connections of all old style keys are completely done away with in the "Victor," and the five minutes' labor of the "relief" operator in twisting adjustment screws to get his key lever to work "to suit" are at once ended. These are the most prominent points that will present themselves to the Telegrapher who uses the "Victor" key for the first time. Add thereto the light **STEEL** lever, which also prevents wearing of the connection, and the long leverage, and you have the two leading advantages claimed for the most perfectly improved of modern telegraph keys. By a turn of the knob to the left the play of the lever is decreased, or by a turn to the right it is increased, thus avoiding the imperfect set screw adjustment heretofore universally in use. These advantages present themselves so clearly and emphatically to every telegrapher that this key has only to be tried to receive the commendation already universally accorded it by every telegraph man who has examined it, which is "THE BEST KEY I EVER SAW."

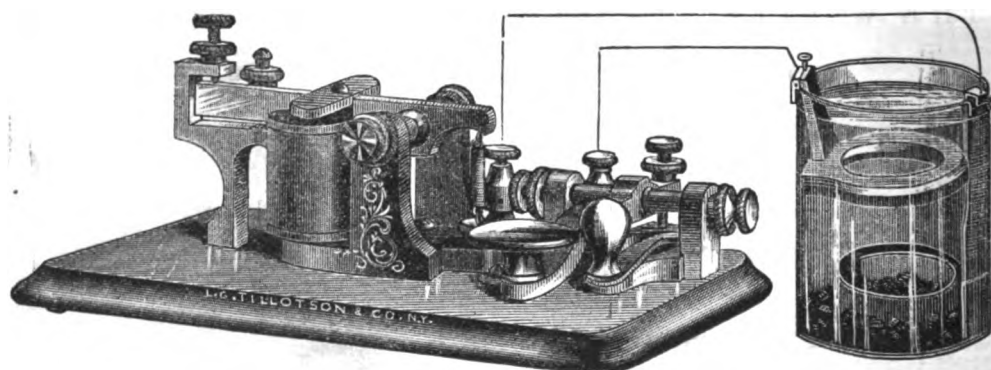
To enable all to test the merits of this great invention, we will, on receipt of price, \$2.50, send, post-paid, by registered mail, to any part of the United States or Canada, a sample VICTOR KEY.

VICTOR KEY mounted on highly polished Hard Rubber Base, with Top Connections, \$3.00, post-paid.

\$3.75. Great Reduction in Price \$3.75.

OF THE CELEBRATED

HOME LEARNERS' TELEGRAPH INSTRUMENTS



Owing to the great demand for these popular instruments, we have been compelled to enlarge our facilities for their production, and are now making them in such quantities as to admit of a considerable reduction in price, which reduction we now give our customers the advantage of. All of these Instruments will be manufactured as heretofore in the best manner, and they will be found the best Student's Apparatus in the market.

For the above Complete and Perfect Sounder and Key Combined, on mahogany base, including Battery, Chemicals, Wire, Book of Instruction and everything necessary for a first-class Telegraph Outfit for the Student's use, for practice at home, or for operating all Short Lines of Telegraph, net cash..... \$3.75
Instruments for short circuit, without Battery..... 3.00
Same by mail, post paid..... 3.50

Instruments without Battery, wound with fine wire, for lines 1 to 15 miles..... \$3.75
Same by mail, post-paid..... 4.25
Cell of Battery..... .65
Instruction Book..... .30
Galvanized Telegraph Wire, per 100 feet..... .30
Remit by Postal Money Order, Draft or Registered Letter,

MANUFACTURED ONLY BY

L. G. TILLOTSON & CO.,

Manufacturers and Dealers in TELEGRAPH AND TELEPHONE SUPPLIES of Every Description,
Nos. 5 and 7 Dey Street, New York.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

2,303 MEMBERS. \$23,000 RESERVE FUND.
Has paid its beneficiaries over \$185,000, and accumulated a reserve fund of \$23,000. No officer or agent draws salary or commission. Average annual assessments to each member less than \$12.

Any person, of either sex, in good health of not less than 18 or more than 45 years of age, employed in telegraph or telephone service, is eligible to membership; and should a member in good standing leave the service, but continue to pay all dues and otherwise conform to the Constitution and By-Laws, he can retain his membership.

Initiation fee \$2. Insurance \$1,000
Any one who is or becomes a member in good standing of this Association is also eligible to membership in the Second Division. For further information, copies of Constitution and By-Laws, blank applications, etc., apply to any of the following named officers or agents:

OFFICERS:

CLARENCE OARY, President. O. H. SUMMER, Vice-President.
A. R. BREWER, Secretary. SAMUEL M. TAYLOR, Treasurer.

EXECUTIVE COMMITTEE:

CLARENCE OARY, New York. O. H. SUMMER, Chicago, Ill.
A. R. BREWER, New York. SAMUEL M. TAYLOR, New York.
W. H. YOUNG, Washington, D. C. F. W. JONES, New York.
JOHN E. ZEUBLIN, Phil. Pa. CHARLES S. H. SMALL, New York.
JAMES MERRIHEW, New York.

AUDITING COMMITTEE

H. C. ROBINSON, Philadelphia, Pa. T. P. SCULLY, New York.
R. W. POPE, New York.

AGENTS:

| | |
|---|---------------------|
| Albany, N. Y. | Charles C. King. |
| Albuquerque, N. M. | D. Hardy. |
| Angusta, Ga. | John W. Brown. |
| Atlanta, Ga. | J. M. Stephens. |
| Baltimore, Md. | R. J. Bloxham. |
| Bangor, Me. | C. E. Bliss. |
| Bismarck, Dak. | Chas. E. V. Draper. |
| Boston, Mass. | E. B. Pillsbury. |
| Buffalo, N. Y. | J. W. Tillinghast. |
| Cedar Rapids, Ia. | T. Fr. Hansen. |
| Cheyenne, Wyo. Ter. | Chas. F. Annett. |
| Cincinnati, Ohio. | G. W. Sheppard. |
| Chattanooga, Tenn. | Charles H. Skelton. |
| Charleston, S. C. | D. M. O'Driscoll. |
| Chicago, Ill. | J. Uhrig. |
| Cleveland, Ohio. | E. L. Melton. |
| Columbus, Ohio. | A. M. Paddock. |
| Crookston, Minn. | Day K. Smith. |
| Denver, Col. | W. S. Rundle. |
| Detroit, Mich. | T. W. Hill. |
| Evansville, Ind. | N. M. Booth. |
| Fort Benton, Mont. | A. B. Keeler. |
| Grand Rapids, Mich. | E. D. Benedict. |
| Galveston, Texas. | David Hall. |
| Grafton, W. Va. | A. T. Cline. |
| Harrisburg, Pa. | E. B. Ziegler. |
| Halifax, N. S. | Alex. E. Hoyt. |
| Hartford, Conn. | E. B. Curtis. |
| Indianapolis, Ind. | F. A. Moore. |
| Jackson, Mich. | D. S. Fleming. |
| Jackson, Tenn. | Nelson E. Jacobs. |
| Kansas City, Mo. | M. D. Wood. |
| La Fayette, Ind. | H. E. Doolittle. |
| La Porte, Ind. | W. M. Noble. |
| Lake City, Fla. | J. G. Thornton. |
| Little Rock, Ark. | E. C. Newton. |
| Louisville, Ky. | Charles Smith. |
| Metropolitan Tel. & Tel. Co., N. Y. | W. G. Good. |
| Mobile, Ala. | B. P. Shreve. |
| Montgomery, Ala. | E. Winter. |
| Memphis, Tenn. | H. E. Conley. |
| Milwaukee, Wis. | D. H. Henshaw. |
| Montreal, Quebec. | James Kent. |
| Nashville, Tenn. | A. H. Stewart. |
| New Haven, Conn. | J. M. Fairchild. |
| New Orleans, La. | J. T. Allyn. |
| No. Sydney, C. B. | Nath'l Martell. |
| New London, Conn. | G. W. Russell. |
| N. Y., L. Erie & W. B.R. (21 Cortlandt St. N. Y.) | O. D. Reed. |
| Oil City, Pa. | Frank Boss. |
| Omaha, Neb. | L. M. Rheem. |
| Pacific Telephone Co., San Francisco. | J. I. Sabin. |
| Philadelphia, Pa. | Chas. E. Wise. |
| Phillipsburgh, N. J. | G. H. Grace. |
| Pooris, Ill. | J. B. Hammatt. |
| Pensacola, Fla. | O. L. Le Baron. |
| Pittsburgh, Pa. | J. E. Palmer. |
| Poughkeepsie, N. Y. | S. K. Ruple. |
| Portland, Me. | C. D. Livermore. |
| Portland, Oregon. | F. H. Lamb. |
| Providence, R. I. | Jas. S. Hall. |
| Petersburg, Va. | John W. Watkins. |
| Reading, Pa. | W. H. Runyon. |
| Rochester, N. Y. | A. J. Stoddard. |
| Reno, Nevada. | Frank H. Macdonell. |
| Sayre, Pa. | E. H. Hamilton. |
| Scranton, Pa. | R. O'Brien. |
| Syracuse, N. Y. | Luther G. Field. |
| St. John, N. B. | B. T. Olmch. |
| St. Louis, Mo. | Geo. W. Brownson. |
| St. Paul, Minn. | Geo. B. Evans. |
| San Francisco, Cal. | A. P. Dubois. |
| Savannah, Ga. | H. Griffith. |
| Springfield, Mass. | W. J. Denver. |
| Springfield, Ill. | W. W. Kelcher. |
| Southern Bell Telephone Co. | John F. Reynolds. |
| Toronto, Ont. | J. Lanskill. |
| Troy, N. Y. | J. W. Spencer. |
| Toledo, Ohio. | E. W. Fish. |
| Vincennes, Ind. | Perry Hood. |
| Washington, D. C. | W. H. Young. |
| Wheeling, W. Va. | Jno. G. Tomlinson. |
| White River Junction, Vt. | G. W. Gates. |
| Wellsville, Ohio. | F. Bruner. |
| Worcester, Mass. | E. W. Bradford. |
| Watertown, N. Y. | D. Van Nostrand. |

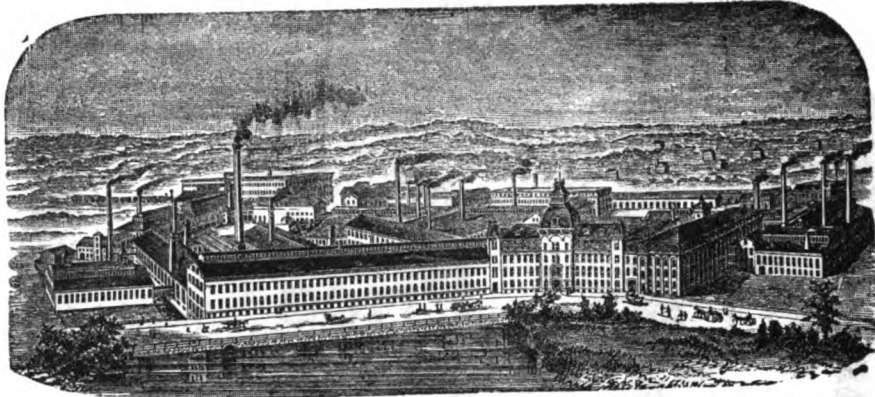
A. R. BREWER, Sec'y.

P. O. Box 3175. New York.
W. U. T. BUILDING, ROOM 58.

TELEGRAPH WIRE.

WASHBURN & MOEN MANUFACTURING COMPANY.

ESTABLISHED 1861. CAPITAL \$1,500,000.



WORCESTER, MASS.

215 LAKE STREET, CHICAGO.

21 OLIVE STREET, NEW YORK.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequalled in that particular.

Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

AND THE BELGIAN ROLLING MILL,
(In connection with the DOUGLAS STEEL FURNACE.)

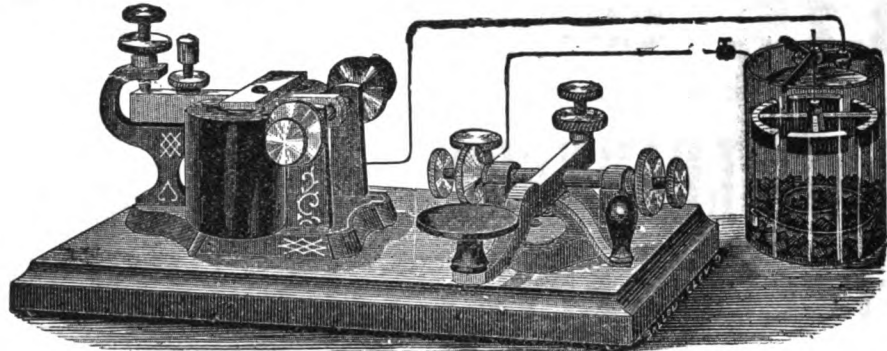
All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

N. B.—The qualities known as Extra Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

EUREKA OUTFIT NO. 2.

Price \$4.00.



ONE PACKAGE BLUE VITRIOL, ONE ROLL INSULATED OFFICE WIRE, ONE INSTRUCTION BOOK.

SENT ON RECEIPT OF \$4.00; OR SENT C. O. D. \$3.00 IF \$1.00 IS SENT WITH THE ORDER.

The above Instrument and Battery are nicely made, durable and warranted to work good.

Parties ordering please give length of line. Send Stamp for circular.

M. A. BUELL & SONS,

144 Superior Street, Cleveland.

FREE TO YOU

By Mail, on receipt of 25c. in currency or stamps.
HOW TO BECOME A TELEGRAPH OPERATOR. The most complete illustrated

Telegraph Instruction Book in the world.

C. E. JONES & BRO.: Dear Sirs:—Instruction Book received O. K., and many thanks. It is worth five times what it cost. If a person could not learn to be an operator after studying it, THEY HAD BETTER GIVE UP. Yours truly,

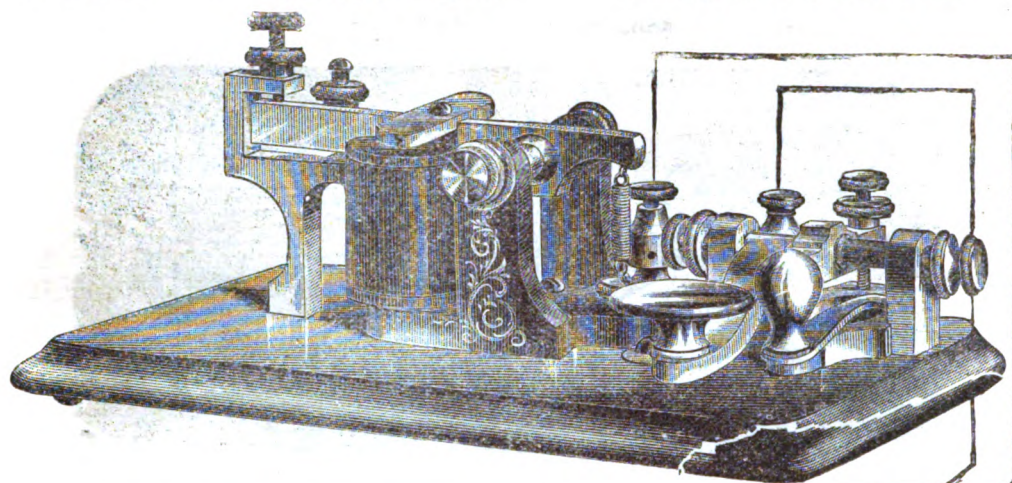
A. L. JAMES, Tipton, Tulare County, Cal.

NOW! RIGHT! NOW! while fresh in your mind, is the best time to send your order, before you misplace this paper and forget our address, and your opportunity is gone.

C. E. JONES & BRO., Telegraph, Telephone and Electrical Supplies,
MANUFACTURERS AND DEALERS IN
No. 51 West Fourth Street, CINCINNATI, O.

The "Morse" Learners' Outfit \$3.75.

**GREAT
REDUCTION
IN
PRICE!!
THE BEST.**



THE BEST.

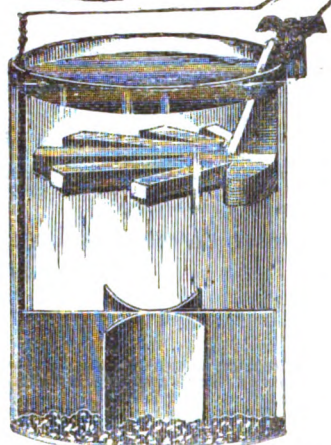
Price, \$3.75, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.
 "Morse" instrument alone, without battery..... \$3.00
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 3.75
 Cell of battery complete..... .65
 "Morse" Learners' Instrument, without battery, sent by mail..... 3.50
 (Battery cannot be sent by mail.)

Instruction Book FREE.

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



The "Morse" Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners, Instruments for short or long lines, from a few feet up to 20 miles in length,
YET OFFERED!

**You are SURE of getting
THE BEST THAT IS MADE
IF YOU SELECT THE "MORSE."**

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.



YOUR NAME FINELY

printed on 15 Bevel Gold Edge Cards, with a small key, or lightning from a clenched fist, or pigeon with envelope and the word "Telegraph" and "73," or a small and perfect Engine and Tender, engraved on the upper turn down corner, 15 for 25 cents; or, 75 either designs, with name, business and address, if desired, for \$1.00. Also Electrotype Cards of Keys, Sounders, Relays, also, Engines and Passenger Trains printed in two colors, 25 for 25 cents; also Embellished Keys 25 for 25 cents. Samples of Operators' Cards 10 cents. 50 New and laughable Illustrations, from Flirtation to Marriage, see out above of one of the fifty Flirtation Cards, 50 for 25 cents. 50 new and rich Transparent Picture Cards, with your name 25 cents. 25 Tinted Portraits of Actresses, 25c. 25 side-splitting Comic Cards, 25c. Morocco card cases, two pockets, 10c. 100 finely printed letter heads, \$1.00. 100 extra No. 6 envelopes, printed to order for \$1.00. Wedding invitations, printed in fine style, 50 for \$2.00, samples, 10c. **Agents Wanted** to take orders for the finest and largest stock of Bevel Gold Edge and Turn Over Corners Visiting Cards, over 100 styles, cut in all styles and shapes, also satin fringe edge, and ribbon bows on turn over corners. Elegant Horseshoe and Clipper cards, also French and American Chromo cards, put up in fine book form, with full instructions, postpaid, for \$1.00, with the privilege of returning if not satisfied, and I will refund money. Agents allowed 25 per cent. of selling prices. A large stock of advertising cards for card collecting—200. no two alike, very funny, postpaid, for \$1.00, will sell fast for 10c. each. 100 large size chromos, assorted, very fine and laughable, for \$1.00; will sell fast for 2c. each. 50 elegant chromos, executed in gold and silver, finely illustrated, for \$1.00, will sell quick, from 3 to 5c. each; 25 best in the market for \$1.00, will sell for 10c. each. These are splendid cards for decorating office. Agents are making money selling them with my elegant stock of Visiting Cards. Address,
F. P. MUNN, CLYDE, Wayne Co., N. Y.



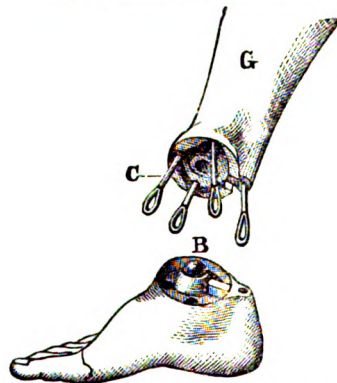
CALIGRAPHS SOLD and orders filled immediately.

STENOGRAPHERS furnished business men without charge for my services.

SHORT-HAND TAUGHT.

Send for circular to

W. G. CHAFFEE,
 Oswego, N. Y.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
 With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.
GEO. R. FULLER,
 Successor to Dr. D. Bly, Rochester, N. Y.

Found at Last.

A CHEAP

COUNTER CLIP,

(Patented July 18, 1882.)

CHEAPER THAN PASTE.

Blanks Removed Without Tearing.

Price, post-paid, 15 cents. Per doz., post-paid, \$1.50.
 Discounts to the Trade or to Telegraph Co.s, in quantities.
 Larger sizes made o screw to wall, for Paper Bags, Wrapping Paper, &c. Circulars free. Address,

W. W. PRICHARD,
 Ironton, Ohio.

SHORTHAND

Writing thoroughly taught situations procured for pupils when competent. end for circular. **W. G. CHAFFEE,** Oswego, N. Y.

I will teach any operator the Corresponding Style of Phonography, who will sell a Caligraph for me.

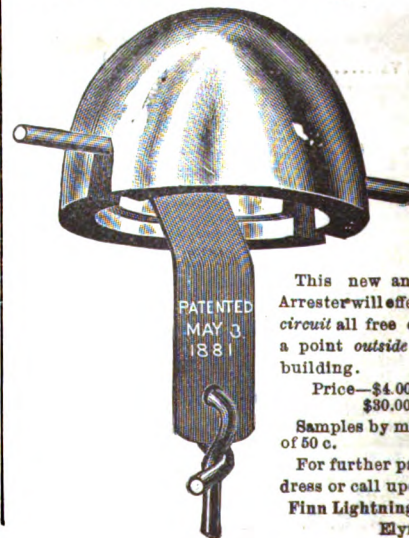
HALBERT E. PAINE, late Comm'r Patents. **STORY B. LADD!**

PAINE & LADD,

Solicitors of Patents and Attorneys in Patent Cases,

Washington, D. C.

The Finn Lightning Arrester.



This new and improved Arrester will effectually short circuit all free electricity at a point outside any office or building.

Price—\$4.00 per dozen.
 \$30.00 per 100.

Samples by mail on receipt of 50 c.

For further particulars address or call upon
Finn Lightning Arrester Co
 Elyria, Ohio.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK. NOVEMBER 20, 1882.

WHOLE NO. 353.

[For the JOURNAL OF THE TELEGRAPH]

FORCE.

ITS ORIGIN, AND THE PHILOSOPHY OF ITS DEVELOPMENT.

All the forces of the Universe, whether they bind celestial spheres, or work among individual atoms of matter, are products of a universal force, the totality of which we may rationally suppose has been invariable since its genesis. The great problem now opening to scientific and philosophic minds is the demonstration of the nature of this universal force.

It is admitted that up to the present half century the data for the working out of this problem have not existed. The varied physical phenomena have of necessity hitherto received only crude and irrational explanations, that have passed current for want of better. The greatest minds lacking certain necessary factors of the problem, have retired baffled from the attempt at its solution. At the same time wise and thoughtful men have had premonitions of the actual unity of all the physical forces and eagerly anticipated its discovery. But to-day it is to be recognized that the times have ripened fast. The abundant inventions and discoveries of our own age, rightly interpreted, already furnish the data heretofore wanting, and now the long waiting problem is capable of rational solution. But few missing links remain for the imagination to supply. It is indeed not too much to affirm, that the new philosophy has already been born which shall crown our century with glory.

The highest achievement in discovery during the present, or any other age is found in the verified law of conservation of force. Scientists bow to its authority universally. It already stands as the touchstone, or test, of all scientific theories relating to the so called "physical forces," so that the theory that is incompatible with that law, may be safely rejected without further examination.

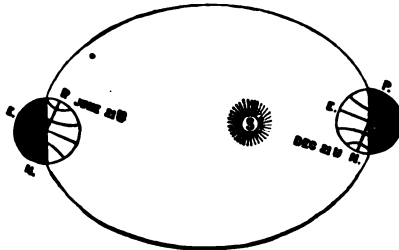
The pre-requisite for the construction of a new physical philosophy, is the demonstration of a universal force acting in consistency with the law "conservation." This philosophy must therefore make of force and its phenomena an *exact science*. Where then is such a force? In searching the universe for a power commensurate with such stupendous demands, the requirements are met only in a single available source, to which the aggregate, or sum of all force may be referred. This sole source is, *the motions of the celestial spheres*.

Some approximate idea of the amount of force induced by these motions, and its entire sufficiency for all the demands, may be gathered from the simple statement of this problem: given; the mass of the earth, its bulk and its velocity, (rotary and progressive,) to find the power. This statement relates to a single celestial sphere, yet it represents a power sufficient, we may believe, for all terrestrial

needs. The same process applied to the innumerable host of celestial spheres satisfactorily expresses the aggregate force of the universe.

Let us briefly consider the office of the celestial motions. They call into action a constituent element of each celestial body. We call it the magnetic element. Our earth, for example, is known to be a vast magnet, having a magnetic axis, approximating to its geographical axis, in position, and terminating in a positive, or northern pole, and in a negative, or southern pole. But this inherent magnetic constituent is quiescent,—is purely potential, or static, and without the ability to act, or to move, except through the operation of the celestial motions. Through these motions, static magnetism becomes converted into vital active currents.

That magnetism conjoined with motion may be made the source of electricity, is well understood. So by their unceasing rotation, the magnetic sun and earth furnish the needed motions, and also the incessant changes of polarity, which are requisite to the completion of the *Celestial Battery*. Thus through the medium of revolving celestial armatures, acting upon celestial magnets, statics are converted into dynamics on a scale commensurate with the demands of the Universe.



The fact that electrical currents pass between the sun and earth is fully accepted of science. The bright sun spot of 1859, simultaneously seen by different observers, produced instantaneous and violent electrical disturbance over portions of two continents.

This is proof of electrical communication, and stands as a fact independent of all methods and theories of explanation. The inter-relation of sun-spot and auroral phenomena is now regarded as fully established by positive demonstration. *In this magnetic inter-action, or inter-relation, is found the key to the whole subject of universal force, and to the methods of its operation* If inter-action between the spheres takes place through the medium of electrical currents, then, most assuredly, those electrical currents must have their origin in some electrical source, and be subject to electrical laws. Our present knowledge of the laws of electrical action is sufficiently abundant and exact to afford a clear insight into the philosophy of the operation of the great *Sun-Battery*. Electrical action on the grander scale of the celestial spheres, may therefore be

studied intelligently through the demonstrations of the lesser scale of our terrestrial magneto and dynamo-electric machines.

Polarity is a fundamental law of electricity. The currents, (however generated, whether magnetically or electrically, cannot act, or move, except through the agency of positive and negative conditions. A *circuit* is therefore indispensable to its operations. If currents come from the sun to the earth, retro-acting currents must inevitably return to the sun. This is rendered indispensable equally by the law of conservation of force, and by the laws of electricity. If this force thus governs the solar system so also does it govern the Universe.

The infinite distance which intervenes between the celestial spheres offers no obstacle to the interaction of the electrical force. All inter-stellar space being essentially a vacuum, distance is annihilated, and all the spheres are brought relatively into close proximity—mercury, 37 millions of miles from the sun, and Neptune, 2,800 millions of miles, stand alike in their relations with the sun. It is now well known that a number of currents may pass in each direction at the same instant, over one and the same telegraph wire, and in like manner, great solar currents may pass to and fro, without interference. The force which controls the Universe is thus found to be purely electrical. Upon the electrical theory, and upon that alone, may all physical phenomena be explained. We use the term electricity in its generic sense—electricity and magnetism being essentially the same.

What electricity is, no man knows—what its laws no man yet fully comprehends; additional knowledge of its varied and marvellous powers is being disclosed to us daily. Its future is big with promise. Upon such of its teachings as science recognizes as *exact*, we found our *New Philosophy*.

The so-called great physical forces are but merely affections or manifestations, of the *One Great Primordial Force*. These varied phenomena must therefore find their fullest and clearest explanations through the interpretations given by the electrical theory.

GRAVITY AS ONE OF THESE AFFECTIONS.

This, the most impressive of physical phenomena, finds its clearest explanation in simple electrical action. Bodies become centres of attraction through the operation of the electrical current. A body of soft iron is thus made magnetic, and remains so, during the continuance of the current. Through so simple an experiment we are taught that *the current which forms the GRAND CIRCUIT incessantly in play between the sun and earth, imbues those spheres with powers of ATTRACTION or GRAVITY; hence the GENESIS of that greatest of forces*. It may therefore be treated as an electrical phenomenon. Gravity is thus shown to be correlated with all the other great forces. This simple explanation brings this hitherto mysterious force down to the ordinary comprehension.

The electrical theory of gravity is itself a rational,

clear and satisfactory philosophy, and easily takes the place of all former theories. It is capable of accounting for all the phenomena most satisfactorily. It accounts for the elliptical orbits of the members of the solar system. In order that the earth's orbit, for example, should be elliptical, the mutual attraction existing between the sun and the earth must necessarily increase and diminish with mathematical exactness and regularity. To such regularly varying attraction, and to no other cause, can the ellipticity be due. The mutual attraction is greatest about the 21st of December, when those bodies are nearest each other; and least about the 21st of June, when they are relatively the most distant. Whether the attraction between the sun and earth shall be greater, or shall be less, depends altogether upon their relative position. Thus, when the earth's south pole presents nearest the sun, the attraction between the two bodies is greatest; and when the earth's north pole presents, attraction is least. Why should this variation in position produce such a variation in attraction? In the light of the electrical theory the following explanation is advanced.

On the 21st of December, the positive sun (S) and the negative south-pole of the earth's magnetic axis (N), are in closest relations to each other, and the north-pole (P,) is out of the field, therefore the opposing conditions, viz.: the positive sun, and the negative portion of the earth, represented by the south-pole, acting in concert, produce attraction between the two bodies, according to the electrical law that unlikes attract each other. On the 21st of June precisely opposite conditions exist. The positive sun and the positive north-pole are in closest relations to each other, and the south-pole is out of the field, attraction between the two bodies is, consequently, at that date lessened, and this in accordance with the electrical law that likes repel each other; therefore at that date they are found at their greatest distance apart, viz.: several millions of miles more distant than on the 21st of December. On the 20th of March, and on the 20th of September, the sun is equidistant from the earth's two polar extremities and the electrical conditions are balanced, and the earth at those periods is equally distant from the sun. Thus the polarity of the spheres determines the ellipticity of their orbits.

Such ellipticity cannot be satisfactorily explained by the old laws of gravitation, viz.: of direct action and inverse squares. If the earth in its orbit were acted upon simultaneously according to both of these laws, it would surely yield to the stronger. During the half of each year, from the autumnal to the vernal equinox, the sun holds the earth (so to speak) at short range, and from perihelion to aphelion the earth advances diagonally against the central attraction of the sun. These facts amount to a rational demonstration that each succeeding round, the earth would fail to reach the farthest limits of the preceding one. The tendency, therefore, would be to bring the orbit into a perfect circle speedily.

Gravity, therefore, as applied to the motions of the celestial spheres, is a legitimate action of the universal magnetic force, and acts entirely independently of the philosophy of the present dogmas, as set forth in text-books, cyclopedia articles, and in the popular conception. Present scientific authorities almost uniformly represent gravity as resident in particles and masses of matter, by virtue of which each particle, or mass, attracts every other. But the greatest of our philosophers have found an insuperable difficulty in a purely inherent

force of attraction, and have believed in the existence of some agent, at the time unknown to them, that was the cause of the attraction called gravitation.

That Prince of philosophers, FARADAY, testifies to not only his own, but also NEWTON's dissatisfaction with that view. He says: "The usual idea of the force implies direct action at a distance; and such a view appears to present little difficulty except to NEWTON and a few including myself." FARADAY declares that, "the usual definition of gravity, as an attractive force between the particles of matter varying inversely as the square of the distance, whilst it stands as a full definition of the power, is inconsistent with the principles of conservation of force." "For my own part," he says, "many considerations urge my mind towards the idea of a cause of gravity which is not resident in the particles of matter merely, but constantly in them, and in all space." In other words, he believed that gravity is produced by the action of some external agency which would account for its varying degrees of force at different distances. He reiterated that nothing could be more in contrast with the assumed variable condition of the gravitating force supposed to reside in the particles of matter, than the known facts of gravity.

NEWTON himself, in direct contrast with what is considered as his theory, says: "that gravity should be innate, inherent and essential to matter, so that one body may act upon another at a distance, through a vacuum, without the medium of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity that I believe that no man who has in philosophical matters a competent faculty of thinking, can ever fall into it."

To a friend he wrote: "It is inconceivable that innate brute matter should without the mediation of something else which is not material, operate on and effect other matter, without mutual contact, as it must do if gravitation, in the sense of EPICURUS, be essential and inherent in it. And this is the reason why I desire you would not ascribe innate gravity to me."

Thirty years subsequently to the enunciation of his theories, and nine years before his death, he deemed it necessary to state that he did not, by any means, consider gravity as an essential property of bodies, "Gravity," he says, "must be caused by an agent acting constantly according to certain laws; but whether this agent be material, or immaterial, I have left to the consideration of my reader."

Is it not safely affirmed that the data lacking in the days of NEWTON and FARADAY, are now at hand? Modern discoveries in electricity have revealed the "agent," which those great men believed in and sought after.

The great truth amply sufficient to a complete interpretation is this; that, *beds become centres of attract on through the operation of the electrical current.*

All the remaining affections of the universal force now classified as the "great physical forces," can only be satisfactorily explained upon the electrical theory.

Several yet unrecognized affections of the great One-Force, that are legitimately entitled to a place in that category, are also closely and satisfactorily accounted for upon that basis. Among these are Sound, Wind, Cold, Crystalization, etc.

The prime factors in the problem of Universal Force are: (1.) The motions of the celestial spheres, —due to a premium mobile wholly undemonstrable, and, (2.) the magnetism inherent in those spheres. In these agencies, and in the performance of their legitimate functions, we find "the Origin of Force, and the Philosophy of its Development."

HENRY RAYMOND ROGERS, M.D.

ANNUAL MEETING OF THE T. M. B. ASSOCIATION.

The sixteenth annual meeting of the Telegraphers' Mutual Benefit Association was held in this city, Nov. 15, and was the most enjoyable meeting the association has yet had.

The New York members had provided at Martinelli's, 511 Fifth avenue, a complimentary dinner to the out-of-town delegates, and at six o'clock a company of about sixty sat down to partake of the good things provided for them. The company was a representative one, and would have reflected credit upon any profession. England was represented in the person of Mr. R. K. Gray, of the India Rubber, Gutta-Percha & Telegraph Works Company of Silvertown.

Mr. Reid, who holds Certificate No. 1, in the association, and to whom, more than any other one man, the progress and development of the T. M. B. A. are principally due, was unanimously chosen to preside. The dinner was the realization of an idea long cherished by Mr. Reid, by which the delegates from a distance should thus socially meet their New York co-laborers in a good cause, and all gather around a well spread table as members of the same grand brotherhood, and become better acquainted. None, therefore, enjoyed the occasion more than did Mr. Reid, as he sat at the head of the table, beaming with pleasure and satisfaction upon the assembled guests; and we think we can safely add that no one could have occupied that position who would have been more satisfactory to those present.

Between the courses Mr. Reid proposed toasts, and called upon the delegates by name for brief post-prandial speeches, which were responded to by Mr. Johnston, of the Operator, F. J. Lerach, of Chicago, E. F. Duffy, of Cheyenne, N. M. Booth, of Evansville, S. S. Garwood, of Philadelphia, W. O. Lewis, Thos. F. Clark, A. R. Brewer, of New York, and others.

Mr. Gray, of London, said that he was delighted to see so fine a body of men engaged in so noble a work. He wished all health and prosperity to the T. M. B. A., and hoped his country would not be long in establishing a similar association.

Mr. McAneeny favored the company with two songs.

Dinner being over, the members were called to order for business.

Mr. Cary, the president, in welcoming the delegates, said the progress of the association during the past year had been exceedingly encouraging. Very valuable tables and statistics would be laid before the meeting for the first time. These would give statistics of the association's business down to the minutest details. On one point, however, it was impossible to give any accurate estimate, and that was the number of tears that had been stopped by the beneficent aid extended by this noble institution.

A committee on credentials and one on nominations were then appointed.

Mr. Tierney suggested that the working operators be represented on the Executive Committee.

The president said that the operators were recognized as the principal source from which the association drew its membership. He asked Mr. Tierney to present the suggestion he had made to the committee on nominations.

The president, in his annual report, said that the condition of the association was highly encouraging. The several officers and agents of the association had labored faithfully, though their only recompense was the consciousness of duty faithfully performed.

The secretary's report shows a membership of

2,324 on Oct. 31, 1882, being a net increase, in the first division, of 179 members during the year. In the second division the membership, on Oct. 31, 1882, was 138, an increase of 8 since Oct. 31, 1881. The receipts from all sources, for the year ending Oct. 31, 1882, were \$24,750 in the first division, and \$25 in the second division; a total of \$24,775, which has been duly turned over to the treasurer. The expenditures for the year were, in the first division, \$2,255.50; in the second division, \$54.85.

There were during the year nineteen deaths, or about 1 to 112 of membership.

Twelve assessments have been levied, numbered 147 to 158, inclusive.

The treasurer's report shows \$18,000 disbursed during the year ending Oct. 31, 1882, for the payment of death claims; \$2,060 was invested in bonds for the reserve fund. The net assets of the first division, after deducting the unliquidated liabilities, amount to \$8,650.07.

The total amount invested for the reserve fund is now \$23,236.25. The amount required for this purpose by section XIII of the By-Laws is \$23,240.

The amendment increasing the reserve fund from one to two per cent. of the entire amount of insurance provided by the association was carried by a vote in round numbers of 1,100 to 300.

Mr. Young offered a resolution, which was carried, requesting the executive committee not to make more than twelve assessments during the coming year.

Mr. Garwood extended a cordial invitation to the association to hold its next annual meeting, which occurs on the third Wednesday in November, 1883, in Philadelphia. The invitation was accepted.

The following officers were elected for the ensuing year:—President, Clarence Cary; Vice-president, W. H. Young; Secretary, A. R. Brewer; and Treasurer, S. M. Taylor; Executive Committee: Messrs. Merrihew, Pillsbury, Uhrig, Edwards and F. W. Jones; Auditing Committee: Messrs. Charles Smith, of Louisville, and E. C. Cockey and Thos. F. Clark, of New York.

NATIONAL TELEPHONE ASSOCIATION.

THE National Telephone Exchange Association held a Convention in Boston, September 5 and 6. The committee on Central Office System and Apparatus Exchange Statistics reported that reports had been received from eighty one exchanges, representing some 25,000 subscribers. There are about 60,000 to 70,000 subscribers in the United States. In New York there are 2,873, and the smallest number in any one place is 10. There is a steady and continued growth all over the country. The number of connections increase each month at all localities with improved service.

In an informal discussion of line construction and maintenance, Mr. E. S. Babcock, of the Evansville, (Ind.), Telephone Exchange Company gave an interesting account of 400 miles of wire maintained by his company and worked successfully without insulators of any kind, by simply attaching the wires to the poles. He said no difficulty was experienced in sending messages, and it was found that the wires thus situated worked better than those insulated.

W. D. Sargeant, of Brooklyn, from the Committee on Electrical Disturbances, read a comprehensive paper treating of three subjects—leakage, induction, and earth and atmospheric currents—saying that the increasing number and length of wires prove the value of good insulation and conductivity. No loose or unsoldered joints should be tolerated on a telephone line. The great enemies to long lines are induction and retardation. The latter appears to be

the most difficult to remove. In so-called anti-induction cables retardation is most manifest. When inductive shields entirely inclose the insulated conductor the metallic current appears to remove much of this trouble. A cable, the longest in this country, has been recently laid from Newark, N. J., to Jersey City, some ten miles. The conductors in this cable change their relative positions at every joint of about 1,000 feet, and the remedy seems to be effectual, conversation on a single grounded circuit being carried on without interference with others, and the sound of several Morse wires working from batteries and dynamos was scarcely audible. As to earth and atmospheric currents, it is believed that with well-insulated lines of non-magnetic material a degree of perfection may be attainable that will leave but little to be desired.

There were present at the several sessions representatives of principal exchanges throughout the country, and quite a number of practical papers were presented.

ELECTRICAL ENGINEERING IN ENGLAND.

DURING the present year vast strides have been made towards the establishment of centres of technical instruction in what must now be looked upon as the absorbing topic of the day. Although previous to this there were many places where students might acquire a good knowledge of electrical work, amongst other subjects, we think we may say without fear of contradiction that two years since there were not more special classes or schools of instruction in matters electrical than could be counted on the fingers of one hand. Now it would require a little thought to enumerate the manifold centres of education where technical instruction in electrical engineering is made a speciality. Beginning with London, we may at once say that we do not know of a more suitable place for a student to acquire that which is not always sufficiently taken into consideration in many technical classes, viz., an elementary knowledge of electricity and magnetism, than by a course of study in the classes of the Birkbeck Literary and Scientific Institute. Many of our younger and well-known electricians have, to our knowledge, gained much valuable information by the good and patient teaching, and the numberless experiments performed before the students of these classes by Mr. Wilson and his assistants. Then we have, amongst others devoted to the complete education of an electrical engineer, the School of Telegraphy and Electrical Engineering, which has, perhaps, been established a greater number of years than any others of an important character.

Better known than all, and probably more fully attended, are the classes of the City and Guilds of London Institute. We have now before us a programme of the technological examinations (1882-83) of this college, together with the papers set in the examination for 1882, which form a very interesting study; and if the questions herein set had been correctly, or even fairly, answered by the students under examination, the result would have shown great proficiency in the pupil and teaching ability which does not fall to the lot of all professors of science, for oftentimes a clever scientist may fail utterly in the endeavor to explain his views to others. We are under the impression, however, that the questions dealing with electrical matters did not show any extraordinary acquirements on the part of the pupils generally, and we are inclined to think that this may be due partly to the want of the elementary knowledge of electricity and magnetism as a starting-point, and partly to the fact that professors of deep learning in the subjects they teach may not be able to descend sufficiently into a simple and

forcible way of addressing a mixed assemblage so as to enable them to convey clearly and indelibly their lectures to their hearers. At King's College, Prof. W. Grylls Adams has established special classes for instruction in electrical engineering, which will doubtless be taken full advantage of. It may not be out of place here to mention that Mr. St. George Lane-Fox, one of the most successful inventors in "electric lighting," was formerly a pupil of Prof. Adams. The "Hammond" College, which has recently been opened, will also be of considerable service in the cause of electrical science, but its operations will be limited to the supply of competent electricians to the "Hammond" Electric Light Company and its off-shoots. In the country, instruction equal to that obtainable in the metropolis is provided in several towns. Bristol and Glasgow have each its university and classes, presided over respectively by Prof. Silvanus Thompson and Mr. Andrew Jamieson, O. E., and both gentlemen are well known in connection with the latest developments of electrical engineering.

Manchester, following the example of these towns, comes prominently forward with the Owens College classes, conducted by Prof. Arthur Schuster and Mr. W. H. Gee. Until recently the impression that the profession of an electrician did not offer much attraction, and that it was already overdone, had a deal of truth in it, but this is no longer the case. The demand for competent men is at present certainly greater than the supply, and electrical may now be compared to railway engineering, in its early days. Never did a subject present greater attractions and inducements to the student than that on which we have made these observations, and we have little doubt but that the centres of instruction we have alluded to will have their resources severely taxed. We notice in the Report of the City and Guilds of London Institute that "any person desiring to form a class for instruction in any technological subject, with a view to these examinations, should apply, as early as possible, stating his qualifications, to the Director and Secretary of the Institute, Gresham College, E. C."

We are not aware whether such classes as exist at the Birkbeck are to be found in the school of the City and Guilds Institute, but if not it would surely be worth while to start such classes as an introduction to the more advanced studies taught by Prof. Ayrton and others.—*Telegraphic Journal and Electrical Review.*

CONSOLIDATION OF ELECTRIC LIGHT COMPANIES IN THE UNITED STATES.

About a year ago the Gramme Electrical Company was formed by a combination of the leading companies owning patents for arc lights and machinery for generating electricity for such use. Recently the combination has been strengthened by union with the Edison Company, thus giving the Gramme Company control of all the leading systems of electric lighting. The combination now comprises the American Electric Company, the Brush Electric Company, the Edison Electric Light Company, the Fuller Electrical Company, the Jablochkoff Electric Lighting Company, the United States Electric Lighting Company, and the Weston Electric Lighting Company, in addition to the original company owning the Gramme patents. Before the last consolidation the Gramme Company controlled all the patents for working arc lights, and now it practically monopolizes incandescent lighting also. The combination would appear to have been made chiefly to prevent litigation between the combining companies and to facilitate the suppression of organizations not in the ring by litigation, or competition, purchase, or otherwise.

Journal of the Telegraph.

PUBLISHED MONTHLY, ON 20TH OF EACH MONTH, AT
196 BROADWAY.

THE JOURNAL is issued on the 20th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,730 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....\$ 1.50
One Copy, six months, postage included..... 75
Single Copies, 15 cents.

ADVERTISING RATES.

One Inch space—each insertion.....\$ 2.00
Half Inch " "..... 1.00
Quarter Column, "..... 4.00
Half " "..... 8.00
One " "..... 16.00

Outs charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, NOVEMBER 20, 1882.

NOTICE.

To Managers of Offices:

We are short of the issue of September, and will be thankful for spare copies in good condition of that number. Address them

"JOURNAL OF TELEGRAPH," N. Y. City.

INCREASE OF TELEGRAPH BUSINESS IN THE UNITED STATES.

The subjects of the comparative increase of the useful, and the relative decrease of that which is detrimental to the welfare of a community are always interesting topics. In this country they are more frequently brought forward than in any other, because it is one of more rapid and marked changes than any other country.

The increase of telegraph business among us during the last sixteen years is worthy of particular attention, as shown by the last annual report for 1882, of the Western Union Telegraph Company. We will call attention to some of the prominent features in round numbers, the exact figures can be ascertained by the report itself.

The consolidation of the telegraph companies in July, 1866, gave 37,380 miles of pole lines, and 75,686 miles of wire, and 2,250 offices. The year ending June 30th, 1867, there were sent over the lines and their increase (which was 10,000 miles of poles and of wire) less than six million messages, being about twenty-three hundred messages to each office. Now, for the year ending June 30, 1882, with 131,000 miles of poles and 374,308 miles of wire, the company sent nearly thirty-nine million messages, and had over twelve thousand offices open for the accommodation of the people, and the average was more than three thousand messages to each office. The number of messages according to

the population of the United States was, in 1867, about seven persons to each message, while in 1882 it was one and a third person to each message, taking the population at 51,000,000, which is nearly a million more than is given by the census of 1880. The number of messages had increased more than six and one-half times, and the wire lines had increased a little more than four times up to 1882. The aid of the duplex and quadruplex instruments in effect largely increased the working lines of the companies between the great business centres. These facts are really astonishing to the business world. To carry the comparison still further, we will give some other statistics of increase side by side.

1867=Receipts.....\$6,568,925
1882=Receipts.....\$7,114,165
1867=Expenses.....3,944,000
1882=Expenses.....9,996,000
1867=Profits.....\$2,624,619
1882=Profits.....\$7,118,000

The expenses do not include the cost of the valuable patents held by the company, which were purchased a few years ago and which now vastly increases the working capacity of the lines of the company.

The average charge per message in 1867, was about \$1.10, while in 1882 it was less than 44 cents. The expenses of managing the company in 1882 were about the same in proportion to the receipts as they were in 1867. This shows that the policy of the company of keeping the rate of charges as low as the expenses will warrant and yet give a fair profit for the investments has been steadily carried out for the benefit of the people.

It may be added that better telegraph service is rendered now than in 1867, and it is improving in that direction.

BUSINESS NOTICES.

For the finest line of New Year cards, send ten cents early to F. P. MUNN, CLYDE, N. Y.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

The Electricians Vade-Mecum N. Y. Agent College of Electrical Engineering, 122 East 26th St. Your Dictionary of Electricity is an exceedingly good one. Nearly every electrical manufacturer and inventor in the U. S. and Europe will find a description or a cut of their invention or apparatus. As the price is only \$2, the edition ought to be sold at once.

E. WESTON,
W. R. POPE,
Electricians.

WORK OF THE WEATHER BUREAU.

ANNUAL REPORT OF GEN. HAZEN, THE CHIEF SIGNAL OFFICER.

The Chief Signal Officer of the Army, in his annual report, states that the Signal Service has greatly increased its usefulness since last year, in spite of greater difficulties than were experienced since the organization of the weather service. Although the work of the corps has grown, there are fewer offices to perform it, and for the fiscal year of 1883 there is \$55,000 less for observation and report of storms than was actually expended in 1860, 1861, or 1862. The

report shows the insufficiency of the force employed to do the work required, and a strong appeal is made for an additional force in order to meet the actual requirements of the service. Extra men are particularly needed for "indication" work and for the inspection service. The report ascribes the difficulties of the service to the defective organization of the corps, and renews the recommendation of last year that the corps be made a distinct branch of the army and have its own complement of officers. On the subject of putting the corps on a permanent basis Gen. Hazen says: "It is necessary that the Army should always possess such a body of men as is found at present in this corps, instructed in the use of signals and in telegraphy. The constant study of this subject in Europe has so far developed the art which received a great impetus from the operations of this corps during the war of the rebellion that a well-trained signal corps is an essential feature of every army. Our own army is to be congratulated that its signal corps has found a field of activity in peace that maintains its discipline and keeps full its ranks. The military duties of the corps are strictly performed. The post at Fort Myer is under thoroughly good discipline. The battalion is organized and under drill; and while the military feature of the corps is thus preserved, because it is of the first importance, its scientific work is done better than that of any other meteorological service in the world. Its weather predictions are from 20 to 25 per cent. nearer accuracy than the predictions of any other service. The average of verified indications for the fiscal year ending June 30, 1882, was 88.2 per cent. The answer to those who talk of giving the weather work to a civil bureau is, that the work is well done in the army; that the observers could not be kept on some of the more exposed stations if they were not soldiers and under orders, and that while now the entire cost to the Government of the men who do the work is less than \$150,000 a year, the cost of the salaries alone of the same number of civilian clerks would amount to more than \$60,000. I trust that at the coming session Congress will take speedy and friendly action on a subject of such great importance to the army and to the commercial and agricultural interests of the country." Eleven new stations have been added, special reports are made for the cotton and tobacco-growing regions of the country and the means for giving warnings to the cattle raisers of Texas against the approach of "northers" have been improved, and now it is expected that the increased work is to go on, and that the service is to continue meeting the growing demands of the country upon it with a smaller appropriation than it has had for a number of years. Experiments have been made during the year with a view of increasing the value of the farmers' bulletin by the addition of a weather chart of the United States, and it is believed that in a short time these charts may be successfully reproduced on the farmers' bulletin. With each year the popular knowledge of the uses of this bulletin enables those interested in agriculture to judge of the correctness of the forecasts, and with the addition of the proposed weather map, individuals will be able to make correct predictions of the weather for localities which it is impossible to provide for in the brief sentence which expresses the prevailing weather in the stations anticipated for an entire district. It is contemplated, as the work of the office advances, to add to this bulletin brief instructions for the use of instruments, which may hereafter be furnished for local observers. The railway bulletin service has proved of great value during the past year. The system of frost warnings for the benefit of the sugar interests in Louisiana has been continued. During the coming year it is proposed to

telegraph frost warnings direct from the signal Office to all telegraph offices in the sugar-growing section. The report describes the operations of the different branches of the service, and states that it is necessary that a better grade and pay than that of Sergeant be provided for the oldest and best men of the service. A recommendation is made for an increase of 50 clerks for the central office to carry on the cotton belt work, the display of frost warnings, the extension of telegraph lines, and other work.

A PRIZE of \$10,000 is offered by the French Government to any who, between July 1, 1882, and July 1, 1887, will have invented the most useful application of the Volta pile. The prize was first opened to competition by Napoleon the Great soon after the eminent philosopher of Como had made his memorable discovery, but it has not yet been achieved. It has now a fair chance of coming to America.

OFFICERS OF THE WESTERN UNION TELEGRAPH COMPANY, ELECTED OCT. 11TH, 1882, FOR THE ENSUING YEAR.

Norvin Green, *President*.
 Thomas T. Eckert, *Vice-President and General Manager*.
 Augustus Schell, Harrison Durkee, John Van Horne, *Vice-Presidents*.
 D. H. Bates, *Acting Vice-President and Ass't. General Manager*.
 J. B. Van Every, *Acting Vice-President and Auditor*.
 A. R. Brewer, *Secretary*.
 B. H. Rochester, *Treasurer*.
 Clarence Cary, *Attorney*.

BOARD OF DIRECTORS.

| | |
|-----------------------|---------------------|
| Norvin Green, | Hugh J. Jewett, |
| Thomas T. Eckert, | J. Pierpont Morgan, |
| Edwin D. Morgan, | Frederick L. Ames, |
| John Van Horne, | Edwin D. Worcester, |
| Augustus Schell, | William D. Bishop, |
| Harrison Durkee, | C. P. Huntington, |
| Jay Gould, | George B. Roberts, |
| Russell Sage, | Zalmon G. Simmons, |
| Alonzo B. Cornell, | Samuel Sloan, |
| Sidney Dillon, | Erastus Wiman, |
| Cyrus W. Field, | Amasa Stone, |
| John Pender, M. P., | George J. Gould, |
| Henry Weaver, | Chauncey M. Depew, |
| Percy R. Pyne, | James W. Clendenin, |
| Robert Lenox Kennedy, | Geo. F. Baker, |

EXECUTIVE COMMITTEE.

| | |
|-------------------|--------------------|
| Norvin Green, | Jay Gould, |
| Thomas T. Eckert, | Russell Sage, |
| Edwin D. Morgan, | Alonzo B. Cornell, |
| John Van Horne, | Sidney Dillon, |
| Augustus Schell, | Cyrus W. Field, |
| Harrison Durkee, | Geo. J. Gould, |

TRANSFER SERVICE.

EXECUTIVE OFFICE
 WESTERN UNION TELEGRAPH COMPANY,
 NEW YORK, Nov. 16, 1882.

To all Transfer Agents and Offices:

The transfer service has been resumed at Marquette, Mich., in I. McMichael's district, and temporarily discontinued at Westchester, Pa., in C. Jamieson's district, and at Hornellsville, N. Y., in H. H. Ward's district.

NORVIN GREEN,
President.

CODE AND CIPHER MESSAGES.

EXECUTIVE OFFICE.
 WESTERN UNION TELEGRAPH COMPANY,
 NEW YORK, November 20, 1882.

THE rule now in force for counting code and cipher messages originating at, and destined to Western Union offices, will be canceled November 20, 1882, and the following adopted and observed thereafter:

Cable rules for code and cipher messages will not be changed.

CODE MESSAGES.

Code messages are messages composed of words which, though not conveying any consecutive meaning, are to be found in ordinary dictionaries or gazetteers.

Example of a code message:

NEW YORK, Oct. 20, 1882.

To ROBERT ANGEL,
 CHICAGO, ILL.

Lenity Nervous Madrid Powder Dolores Publish Mexico.
 (Sig.) BRONSON AND SMITH.

(Check) 7 paid.

Code messages are to be counted and charged as ordinary messages.

CIPHER MESSAGES.

Cipher messages are messages composed wholly or in part of letters, (grouped or otherwise, but not forming words found in dictionaries or gazetteers), figures, letters and figures or either combined with ordinary words.

Example of a cipher message:

NEW YORK, Oct. 20, 1882.

To ROBERT ANGEL,
 CHICAGO, ILL.

Lenity 23156 hgbomo 72k3 powerful bedefghkrms 9397368.
 (Sig.) BURNET AND SMITH.

(Check) 15 paid cipher.

In cipher messages, count first the number of words in each group allowing three figures or letters to a word, thus: in the first group given above, the figures "23156" count as two words; the letters "hgbomo" count as two words; the group "72k3" count as two words; the letters "bedefghkrms" count as four words; the figures "9397368" count as three words, in all thirteen. To the number thus obtained add the ordinary words ("Lenity" and "Powerful") in the message, making in all fifteen words.

Marks of punctuation if intended for transmission will be included in the count, as if they were figures or letters.

The word cipher should appear in the check as in the example.

No extra charge will be made for cipher messages.

THOS. T. ECKERT,
Vice P. es. and Gen. Manager.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE.
 WESTERN UNION TELEGRAPH COMPANY,
 NEW YORK, November 20, 1882.

To all offices on Western Union lines:

The following changes, which have been made since October 20, 1882, should be entered in the Tariff Book, and the list of New Offices given in the JOURNAL of September 20, 1882, as they will not be republished.

Places in italics are to be found only in the list of new offices given in the Journal of September, 20, 1882.

CHANGES.

ALABAMA.

275 Boyds Switch changed to 275 Limrock.

ARKANSAS.

371 Peach Orchard, closed.

CALIFORNIA.

772 Cambria, reopened.

* Congress Springs now * * Congress Springs, \$2.75 delivery from Santa Clara.

808 Marshalls, reopened.

* Saratoga now * * Saratoga, \$2.50 delivery from Santa Clara.

803 San Pablo now * * San Pablo, 50 0 San Pablo Sta.

743 Santa Monica, closed.

749 Tipton, closed.

Cape Mendocino is in Square 826.

791 Cooper's Switch, closed.

713 Mammouth Tank should read 713 Mammoth Tank.

770 Pina should read 770 Pino.

COLORADO.

628 Parlin, closed.

CONNECTICUT.

31 Watertown now * Watertown, 10 0 telephone.
 Waterbury.

DAKOTA.

Business for Ft. Randall now mailed from White Swan.
 916 Greenwood, reopened.

FLORIDA.

* Lake Eustis now * * Lake Eustis, free, from Fort Mason.

GEORGIA.

256 Ridge Valley Iron Works changed to 256 Hermitage.
 185 Perkins Junc, closed

IOWA.

4 6 Benson Grove, reopened.
 361 Lou on changed to 367 Lowden.
 417 Poto changed to 417 Plano.

KENTUCKY.

143 Morgan, closed.
 243 Dun rail, closed.
 320 Wings should read Wingo.

LOUISIANA.

* Bastrop, Erase "N. M."
 395 Maringouin, reopened.

MANITOBA.

Stolewall, reopened

MASSACHUSETTS.

* * West Dennis now 10 0 telephone, to Dennis.

MEXICO.

* Guaymas now 75 5 Nogales, - rz.
 * Hermosillo now 10 4 Nogales, - rz.

The following change in "Arrif of other lines" via El Paso, Texas, has been made:

Chihuahua, 34 3, Juaquite, 63 5, Gallego, 73 6, Laguna, 51 7, Monteruma, 67 5, Paso Del Norte, 40 2, Samalayuca, 53 4, San Jose, 58 4.

MICHIGAN.

119 Filer City now * * Filer City, mail, Manistee.
 241 Grosbeak, closed.
 267 Hammond changed to 267 Dutton.
 231 Mosherville changed to 31 Scipio.
 * * Onkuma now W. U. office, square, 119 Ch Manistee.
 269 Walkup changed to West Troy.

MISSISSIPPI.

* Starkville, Erase "N. M."

MONTANA.

971 Rock Island, closed.

NEBRASKA.

474 Sheridan changed to 474 Auburn.

NEW HAMPSHIRE.

* * Attrim, 15 cents by express, or \$1.25 special delivery Hillsboro Bridge.
 21 Intervale, closed.

NEW JERSEY.

41 Cherry Hill. Erase "Ch. Hackensack."
 47 Elberon now * * Elberon, 15-0 Long Branch.
 Erase * * Stockton Camden Co.
 Centerville, Passaic Co., is in square 41, not 47.

NEW YORK.

83 Bingham. P. O. Lockwood.
 40 Catskill Point, closed.
 74 Community, closed.
 74 Durhamville, reopened.
 211 Four Mile, closed.
 * * Jonesville, now W. Union office, square 45
 * * Kana, now W. U. office, square 10 1.
 56 Madrid, closed.
 * Schoharie, C. H., now 15-1 Central Bridge.
 46 Unionville is in Orange Co.

OHIO.

170 Remont, closed.
 181 New Lexington is in Perry Co.
 * Plymouth is in Richland Co.
 Erase * * Remont City.
 212 Storms, closed.

ONTARIO.

Burlington Beach, closed.
 Buxton, closed.
 Frankville, closed.

Grimsby Camp, closed.
Kintail, closed.
Port Whitby, reopened.
Tilbury Sta. P. O. Henderson.
Caledonia Springs, closed.

OREGON.

Redfield is in square 805

PENNSYLVANIA.

* Centreville, Butler Co., now 1.00-0 special delivery, or 25 cents by stage from Wick.

140 Centreville Sta., Butler Co., changed to 140 Wick.

* High Spire, now * * High Spire 180-0 or mail, Harrisburg.

140 Pine Grove, Mercer Co., changed to 140 Grove City.

58 Dunmore, now checked direct. Erase "Ch. Scranton."

140 Evansburg, Butler Co., changed to 140 Evansboro, Butler Co.

QUEBEC.

Bord a Plouffe, closed.

Cocouna, closed.

Gentilly, closed.

Lavalles Corners changed to Boulogne.

Madeleine River, closed.

Madeleine Light House changed to Cape Madeleine Light House.

Point au Pic, closed.

Point aux Trembles, closed.

St. Irene, closed.

St. Maurice, closed.

St. Roch des Aulnaix, re-opened.

Ulverton, closed.

Bergeronne, closed.

RHODE ISLAND.

18 Drownville, closed.

22 Watch Hill now * Watch Hill, 20-0 telephone Westerly.

SOUTH CAROLINA.

136 Ridgeville, re-opened.

156 Varnville, closed.

168 Whitakers, re-opened.

TENNESSEE.

Manchester re-opened in square 255, instead of 256, as given in Tariff Book.

291 Bon Aqua Springs, closed.

245 Lansing should read 245 Lancing.

TEXAS.

* Decatur now 25-2 Ft. Worth. Erase the rates and routes Via Denison and San Antonio.

470 Hughes Springs, closed.

674 Marathon, closed.

648 Wataga should read 648 Watauga.

Managers of offices which exchanged messages with Winona during the month of October, 1882, are requested to send Winona copies of such messages. The Winona office and papers for October were recently destroyed by fire.

VIRGINIA.

The "tariff for other lines" from Richmond to Fish Hawk, Lester Manor, Tunstall's, and West Point is now 25 and 2.

142 Healing Springs, closed.

* Herndon, 25-2 Alexandria, re-opened.

152 Warm Springs, closed.

WASHINGTON TERRITORY.

* 738 Tuckel, in JOURNAL of September 20, 1882, should read 738 Touchet.

WISCONSIN.

847 Grand Rapids now * * Grand Rapids. Messages delivered from Centralia.

* Neillsville now W. Union office, square, 847.

WYOMING.

* Powder River now W. Union office. Tariff same as to Ft. McKinney.

ATLANTIC CABLE.

All messages to Spain, except such as are addressed to Barcelona via Marseilles, should be charged 16 cents per word from London. Barcelona messages may be sent via Marseilles at a rate of 15 cents per word from London. Tariff Book, page 347, should be changed accordingly.

The land lines between Cairo and Souakim, in Egypt, have been interrupted. Messages for Djedda and Mecca are therefore posted at Suez.

Telegraph communication has been established with Tripoli. Rate, 29 cents per word from London.

For the second paragraph of rule 5, page 341 of the Tariff Book, substitute the following:

The name of the "place from" must be telegraphed in the check of the message, but the indication of the route must

be inserted immediately after the address, that is—as a part of the address, and before the text or body of the message.

CUBA CABLE.

Communication via the cable between St. Croix and Trinidad is interrupted.

CENTRAL AND SOUTH AMERICAN CABLES.

As announced by telegraphic order October 20, 1882, the cables and lines of the Central and South American Telegraph Co. have been opened to Lima and connection made with cables south to Valparaiso and places beyond named below. For rates to all cable stations as far south as Valparaiso, see Journal of Aug. 20, 1882 (in which the rate to Valparaiso should be \$3.03, and to Valparaiso \$3.07 per word.) Also Journals of Sept. 20, and October 20.

The following rates will be charged in addition to the rate to Valparaiso: To Buenos Ayres and other stations in the Argentine Republic, 91 cents per word.

To Monte Video for telegrams in Spanish charge rate to Buenos Ayres and add \$1.15 for ten words, and 60 cents for each additional ten or fraction of ten words. For telegrams in other languages and for code or cipher messages to Monte Video charge the Buenos Ayres rate, and add \$3.45 for ten words, and \$1.75 for each additional ten or fraction of ten words.

Charge the following word rates in addition to the rate to Valparaiso: To Pernambuco and Rio Janeiro, \$3.52, Rio Grande, \$2.55. Santa Catarina, \$2.91.

NEW OFFICES.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book and in the JOURNAL of Sept. 20, 1882, as well as to those named below.

ALABAMA.

264 Dudley. 266 Greenwood. 275 Limrock.

* * Menlo, mail Limrock.

ARIZONA.

661 Ash Fork. 661 Chino. 641 Nogales.

641 Calabasas.

* Total Wreck, 25 2 Pantano.

ARKANSAS.

441 Bierna. 881 Goodwin. 449 Mountainburg.

371 Delaplaine. 401 Judsonia. 449 Porter.

401 Garner. 892 Hazen. 449 Rudy.

449 Van Buren.

* Altus, 40 3 Little Rock.

* Hensley, 50 4 Pine Bluff.

* Dermott, 50 4 Pine Bluff.

* Redfield, 50 4 Pine Bluff.

* Wrightsville, 50 4 Pine Bluff.

* Woodson, 50 4 Pine Bluff.

CALIFORNIA.

789 Corning. 800 San Pablo Station.

* Ft. Bidwell, 50 3 Ashland, Oregon.

COLORADO.

628 Cerro. 628 Delta. 628 Montrose.

* Easton (N.M.) 40 3 Denver.

CONNECTICUT.

29 E. Berlin.

* * Westport, 10 0 Saugatuck.

DAKOTA.

884 Ardock. 889 Grafton. 890 Portland.

926 Bramhall. 895 Larimore. 890 Ripon.

897 Oakview. 884 Mauval. 921 White Swan.

915 Columbia. 889 Minto. 920 Rudolph.

926 Frankfort. 895 Ojata. 896 Walcott.

* Galena, 25 2 telephone, Deadwood.

FLORIDA.

219 Jasper.

* 1 t. Mason, (N.M.) 100 6 Lake City.

* Limonia, 125 8 Lake City.

* Sumterville, 75 8 Lake City.

GEORGIA.

206 Crawford. 286 Hermitage. 217 James Sta.

246 Decatur.

* Dallas 30 2 Atlanta.

* Ga. Pacific Junc. 25 2 Atlanta.

* Indian Springs 40 3 Atlanta.

* James Ferry 40 3 Atlanta.

* Lexington, 70 0 (rawford

* Locust Grove 30 2 Atlanta.

* McDonough 25 2 Atlanta.

* Powder Springs 25 2 Atlanta.

* Rockmart 40 3 Atlanta.

* Stockbridge 25 2 Atlanta.

* Tryon Factory, 80 2 Rome.

IDAHO.

578 Montpelier. 578 McCommon.

ILLINOIS.

816 Argyle. 346 Nelson. 319 Wayne City.

847 Marietta.

INDIANA.

242 Bloomingsport. 262 Leonard. 272 Stinesville.

290 Buell City. 290 Linton. 289 Wingate.

292 De Soto.

INDIAN TERRITORY.

477 Tulsa.

IOWA.

455 Churdon. 468 Hawarden. 468 Orange City.

455 Clare. 468 Howell. 417 Plano.

455 Dana. 468 Ireton. 426 Rolfe.

425 Gilmore. 426 Kelley. 435 Rockwell City.

463 Granville. 367 Lowden. 425 Rodman.

417 Harvard. 463 Maurice. 463 Sheridan.

* Allison 25 2 Waverly.

* Aspinwall 40 3 Marion, or 25 2 Council Bluffs.

* Astor 40 3 " " 25 2 "

* Atkins 25 2 " " 40 3 "

* Bagley 40 3 " " 20 2 "

* Bayard 40 3 " " 25 2 "

* Bristow 25 2 Waverly.

* Cambridge 30 2 Marion, or 40 3 "

* Collins 25 2 " " 40 3 "

* Onon Rapids 40 3 " " 25 2 "

* Covington 25 2 " " 40 3 "

* Dedham 40 3 " " 25 2 "

* Dehance 40 3 " " 25 2 "

* Dumont 25 2 Waverly.

* Dunbar 25 2 Marion, or 40 3 "

* Elberon 25 2 " " 40 3 "

* Elkhader 15 1 telephone, McGregor.

* Ferguson 25 2 Marion, or 40 3 Council Bluffs.

* Gladstone 25 2 " " 40 3 "

* Hansell 25 2 Waverly.

* Haverhill 25 2 Marion, or 40 3 "

* Huxley 30 2 " " 40 3 "

* Jamaica 25 2 " " 30 2 "

* Keystone 25 2 " " 40 3 "

* Louisa 25 2 " " 40 3 "

* Madrid 30 2 " " 40 3 "

* Marthan 40 3 " " 25 2 "

* Maxwell 25 2 " " 40 3 "

* Melbourne 25 2 " " 40 3 "

* Newhall 25 2 " " 40 3 "

* Panama 40 3 " " 25 2 "

* Pernia 40 3 " " 25 2 "

* Potter 25 2 " " 40 3 "

* Portsmouth 40 3 " " 25 2 "

* Rhodes 25 2 " " 40 3 "

* Sumner 25 2 Waverly.

* Tripoli 25 2 " " 40 3 "

* Templeton 40 3 Marion, or 25 2 "

* Underwood 40 3 " " 25 2 "

* Van Horne 25 2 " " 40 3 "

* Vining 25 2 " " 40 3 "

* Woodward 30 2 " " 40 3 "

* Warrack 40 3 " " 25 2 "

* Yorkshire 40 3 " " 25 2 "

KANSAS.

612 Argonia. 456 Connors. 468 Robinson.

514 Assaria. 507 Green.

514 Cedar Grove. 463 Padonia.

KENTUCKY.

248 Boyd. 224 London. 254 St. Marys.

224 East Bernstadt. 244 Bileys. 244 Pittman.

* Esculapia Springs 10 1 telephone, Vanceburg.

* Aden 25 2 Huntington, W. Va., or 35 2 Lexington, Ky.

* Denton 25 2 " " or 35 2 "

* Farmer 25 2 " " or 30 2 "

* Meade 25 2 " " or 35 2 "

LOUISIANA.

424 Bunkie. 434 Morrows. 404 Ravenwood.

376 Davis. 404 Negrofoot. 375 St. John.

408 Gordon.

* Atherton 50 4 Tallulah.

* Long Springs 10 1 Minden.

* Newton 25 2 (25 1 N.M.) Natches, Miss.

* Waterproof 25 2, (25 1 N.M.) Natches, Miss.

MAINE.

28 West Bethel.

* Green's Landing, Deer Isle, 25 2 Ellsworth.

* Greenville, 25 2 telephone, Farmington.

* Madrid 20 2 telephone, Farmington.

* Rangeley 25 2 telephone, Farmington.

MANITOBA.

Burrows. Indian Head. Stony Mountain.

Capelle. Marquette. Verden.

Cassils. Moosomin. Wolfe Creek.

Elkhorn. Poplar Point. Wolsley.

Fleming. Red Jacket.

Grenfell. Regina.

MASSACHUSETTS.

25 East Medway. 21 So. Sudbury. 21 West Medford

* Acushnet 10 0 telephone, New Bedford.

* Onset Bay 15 0 telephone, New Bedford.

* Rochester 15 0 telephone, New Bedford.

MEXICO.

* Imuris 40 3 Nogales, Arizona.

* Llana 40 3 " "

* Magdalena 40 3 " "

* Santa Ana 40 3 " "

* Pesquiera 40 3 " "

* Oriz 40 3 " "

* Torres 40 3 " "

* Bustamante 37 3 Laredo, Texas

* Guadalupe (Zacatecas) 430 43 Galveston, Tex.

* Jalpa 400 43 Galveston, Tex.

The tariff for "other" lines from Galveston, Texas, to the following is 400-40:

Aramberri.

Ayala.

Buena Vista (Distrito Federal).

Buena Vista (Sonora).

Dondominguillo.
Fuerte.
Galeana.
Guadalupe de los Reyes.
Huatusco.
Jimenez.
Juchitán.
Lerdo Villa.
Mazatepec.
Miahuatlan.
Padilla.
Patos.
Paso del Tuzajo.
Parras.
Pootillos.
San Pedro del la Colonia.
San Fernando de Pressas.
San Felipe del Obraje del Progreso.
San Juan de las Llanas.
San Marcos de Colonia.
Taretan.
Tacambaro.
Tlaxianguitepec.
Uruapan.
Villa Garcia.
Villa del Reyes.
Villa Juarez.
Valle de San Francisco.
Zaragoza.
Zacapoaxtla.

MICHIGAN.

119 Bear Lake. 251 Nottawa. 250 Six Lakes
269 Big Rapids June 127 Fellsville. 230 South Bay City.
Ch. Muskegon. 231 Scipio. 269 W. Troy, Ok.
127 Elmira. 836 Stambaugh. White Cloud.
260 Dutton.
127 Leveing.
* Dollarville, 40 3 Marquette.
* Hendria, 40 3 Marquette.

MINNESOTA.

884 Beltrami. 865 Franklin. 880 Nelson.
891 Bearsley. 860 Kimberly. 865 Osseo.
861 College Place. 861 Minneapolis. 887 Rushmore.
865 Fairfax. 891 Norcross. 884 Shirley.
865 Gibbon. 873 Norton. 890 Tenney.

MISSISSIPPI.

362 Hardy.

MISSOURI.

429 Galloway. 448 Kenoma. 408 Millard
* Cairo, 10 1 telephone, Moberly.
* Lamar 10 1 telephone. Lamar Sta.
* North Greenfield, 25 2 South Greenfield.
* Rockport. 25 2 Phelps
* Sumner. 25 2 Unionville.

MONTANA.

956 Allard. 961 Merrill. 961 Park City.
960 Huntley. 960 Pompeys Pillar. 971 Trout Creek.

NEBRASKA.

474 Auburn. 922 Ewing.
474 Berlin. 474 Hickman. 519 North Loup.
473 Craig. 503 Hoskins. 927 Thatcher.

NEW BRUNSWICK.

3 Kent Junction.
* Seal Cove, Grand Manan, 25 2 Eastport, Me.

NEW HAMPSHIRE.

17 Bye Beach Cable Sta.

NEW JERSEY.

52 Columbia, War- 52 Marksboro. 52 Stillwater.
ren Co. 41 New Milford. 41 Two Bridges.
41 Grovestend, Ok. 52 Sparta Depot. 52 Washingtonville.
East Orange.

* Atlanticville, 25 0 Long Branch.
* Branchburg, 10 0 Long Branch.
* Branchport, 30 0 Long Branch.
* Mottmouth Park, 50 0 Eatontown.
* No. Long Branch, 25 0 Long Branch.
* Oceanport, 50 0 Eatontown.
* Oceanville, 150 0 Long Branch.
* Pleasant Bay, 30 0 Long Branch.
* West End, Long Branch, 25 0 Long Branch.

NEW MEXICO.

566 Los Cerrillos. 630 Carthage

NEW YORK.

120 Ashford. 120 Java Centre. 101 Perkinsville.
120 Curriers. 120 Johnsonsburg. 101 Silver Lake June
110 E. Be hany. 101 Leicester. 120 Varysburg.
101 Grovesand, P. O. 46 Mongaup. 110 York.
No. Sparta. 120 No. Java.

* Brookfield, 15 1 North Brookfield.
* Greenwood, Steuben Co. 10 1 telephone, Canisteo.
* Jasper, 10 1 telephone, Addison.
* Monterey 10 1 telephone, Keaver Dams
* Port Dickinson, 10 1 telephone, Binghamton.
* Rexville 15 1 telephone, Canisteo.
* Troupsburg, 10 1 Addison.
* Woodhul, 10 1 telephone, Addison.

NORTH CAROLINA.

116 Chadbourne. 184 Old Fort.
* Old Sparta, 25 2 Tarboro.

NOVA SCOTIA.

* Ohio, 15 1 telephone, Yarmouth.

OHIO.

211 Curtice. 242 Florence. 170 Sandyville
242 Centerville. 231 Lorain. 170 Sparta.
242 Dadds. 231 Limestone. 211 Trowbridge.
180 Earlville. 242 Lytle. 159 Washingtonville.
232 Fletcher. 170 No. Industry. 232 Yorkshire.
211 Williston.

* Berlin Centre, 25 2 Alliance
* Cincinnati Race Course, 25 2 Cincinnati.

* E. Ashtabula, 15 1 No. Kingsville.
* New Lexington, Highland Co., 35 3 Cincinnati or Chilli-
cothe.
* No. Jackson, 25 2 Alliance.
* Plymouth, Ashtabula Co., 25 2 No. Kingsville.

Ballantree Sta. No. Buxton.
Falkirk. Moscow. Walsh.
New Germany.

OREGON.

818 Latham. 785 Wyeth.
* Lakeview, 50 3 Ashland.
* Linkville, 50 3 Ashland.

PENNSYLVANIA.

130 Anchor. 140 Evansboro, But-151 McKean Farm.
130 Byrums. ler Co. 151 Pine Creek.
101 Coal Center. Ok. 140 Grove City. 111 Rodde.
California. 52 Gravel Place. 130 Vandergriff.
159 East New Castle. 162 Hyner. 140 Wick.

* Leisenring, 25 2 Connelville.
* Taylorsville, Bucks Co., free. Washington Crossing, N. J.

QUEBEC.

Boulogne. Cape Madeleine. Sault au Cochon.
Bersimie. Light House. St. Alexis Grand Baie
Breckenridge. Dundee.

RHODE ISLAND.

* Kingston Hill 20 2 telephone, Providence.

SOUTH CAROLINA.

136 Santee River.

TENNESSEE.

194 Limestone

TEXAS.

470 Avenger. 491 Louisa. 655 Monahan (South).
490 Bartlett. 603 Miller. 673 Murphysville (So.).
648 Keller. 600 McGregor.

* Bertram, 40 3 Austin.
* Cleveland, 35 3 Houston.
* Livingston, 50 3
* Shepherd, 50 3
* Wichita Falls, (N. M.) 40 3 Ft. Worth.

UTAH.

In addition to the W. Union rate to these
576 Lehi June. offices an additional charge of 30 and 2
576 Ironton. should be made to cover the tolls of a con-
576 Tintio. necting line over which messages to these
offices must pass.

VERMONT.

36 South Shaftsbury. 81 Tunbridge.
* Randolph Centre, 10 1 telephone, West Randolph.

VIRGINIA.

118 Bentonville. 123 Stuarts Draft.

* Pedlars 40 3 Richmond.

WASHINGTON TERRITORY.

722 Alto. 794 Chehalis. 794 Winlock.
* Irondale 75 5 Seattle.

WISCONSIN.

855 Cameron. 335 Fuller. 841 Phinelanders.
855 Cartwright. 841 Montello. 855 Rice Lake.

* Delafield 10 1 telephone, Nashotah.
* Duck Creek, 15 0 telephone, Green Bay.
* Ellettsville, 20 0 telephone, "
* New Franklin, 15 0 telephone, "
* Ironton, 10 1 telephone, Laval.
* Rochester, 10 1 telephone, Burlington.
* Spring Prairie, 10 1 telephone, Springfield.
* Waterford, 10 1 telephone, Burlington.

WYOMING.

548 Archer.
* Hartville 15 1 telephone, Fort Laramie.
NORVIN GREEN, President.

YELLOW CEDAR

TELEGRAPH, ELECTRIC LIGHT

AND

TELEPHONE POLES,

FOR SALE AT

BUFFALO, BLACK ROCK, N. Y.

The Michael Bay Lumber Co., Limited, are prepared to contract and deliver on Cars, or at Lake Ports by vessel, Nice, Sound, Straight Telegraph Poles, which will give general satisfaction for city and through lines from city to city. Poles will be kept on hand and supplied on short notice. Poles can be supplied for lines five hundred to one thousand miles long from sixty to ninety days from date of order. Poles for country lines twenty-five, thirty and thirty-five feet long; city lines, forty, forty-five, fifty, fifty-five and sixty feet long, five, six and seven inches at top end. Orders from one to ten car lots filled in from three to ten days. Also oak and cedar railroad ties and fence posts. All orders addressed to A. A. COLBY, Agent, Buffalo, N. Y., will receive prompt attention.

The Hinsdale Patent Five-Shot Breech-Loading SHOT GUN AND RIFLE COMBINED.

IN FIRE ARMS THE GREATEST INVENTION OF THE AGE.



By a simple and ingenious invention it is so constructed that it can be loaded with ball and shot cartridges at the same time. The price we offer the HINSDALE Patent Five-Shot Breech-Loading Rifle and Shot Gun at, barely covers the cost of manufacture; in fact, if all our contracts for material and work had not been placed months ago, before the great rise in metals and labor, we could not make these FIRE-ARMS at nearly the present cost. The HINSDALE PATENT SHOT GUN AND RIFLE are Warranted and Guaranteed to be made of as fine material and in as thorough a manner in every respect, as any Fire-arm in the world! Every part is charged in six seconds if necessary. The barrels are manufactured from the very finest and best material and tested in the most careful manner. All the trimmings are Nickel Plated—BLACK WALNUT STOCK and very handsomely designed. IVORY PISTOL GRIP, ROCKY MOUNTAIN MUZZLE SIGHT, and the best of STEEL LOCKS. This marvellous invention as a Breech-Loading Shot Gun is pronounced equal to the best imported English guns that are selling at \$100 each, and as a RIFLE it is warranted perfect in every particular. We know that no other gun gives such complete and universal satisfaction, hence we desire to have the Hinsdale Gun introduced throughout the entire United States, and solely for this purpose of introduction, we make the following SPECIAL OFFER to the Readers of this paper. UPON RECEIPT of \$7.50 we will send One HINSDALE Gun, BOX OF CARTRIDGES, and SET TOOLS all securely packed in a wooden case, prepaying any and all shipping charges thereon, provided this advertisement is cut out and forwarded to us, with order, on or before March 31st, 1883.

A Great Chance, don't miss it, as the price will be advanced after expiration of this Special Offer to \$15.00. Read these Testimonials, samples of hundreds received by us from purchasers:
"I received the HINSDALE PATENT SHOT GUN AND RIFLE, like a very much killed crow with its fourteen rods the first shot."
"The HINSDALE GUN received by me is creating a great sensation. Ship me another. Enclosed find check."
"The regular price of this Rifle when placed upon the market and furnished to the trade, will be \$15. If desired we will send Rifles C. O. D., with the privilege of examination at Express Office before taking up, on the receipt of \$3.00 to insure us against loss of Express charges. Send money by Registered Letter, Bank Draft, or Postal Money Order to
E. J. HINSDALE & CO., 252 Broadway, New York



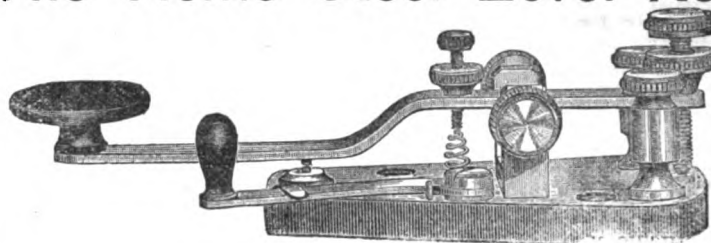
ANOTHER TELEPHONIC DISCOVERY.

In the course of experiments on magnetic currents, Mr. Willoughby Smith has made a remarkable discovery—one that may possibly have an important influence on the future of telephony. It is well known, to those who have ever had a magnet, that it acts upon pieces of iron, even though an ordinary table-top intervenes; the mysterious "property" (for want of a more definite term) which enables a magnet to attract iron being uninfluenced by the presence of other matter. It is this property which is at the basis of Mr. Smith's discovery—a discovery that leads to the idea that ultimately we may be able to telephone without having any connecting wires. The apparatus employed in this, the earliest stage of the discovery, is very simple, consisting merely of a large tuning-fork and a flat coil or disc of insulated wire, with a suitable battery. The fork is arranged with a small electro-magnet between the prongs, which, when a current is passed through its coil, prolongs the vibrations of the fork indefinitely. On one of the arms of the fork is a contact piece, which makes and breaks the circuit, so that the current is alternately sent through the main line or a shorter circuit. In the main line is the disc, or coil of wire, which is confined between two sheets of cardboard placed in a frame. The current traversing this coil sets up what are known as magnetic lines of force, which act indirectly on pieces of "iron" moved in the field, the effect varying with the number of lines of force impinging on the "iron," which may have any form, from a telephone diaphragm to a kitchen poker. Here comes in the discovery. If a tuning-fork so arranged is set in motion, its vibrations are continued by the action of the electro-magnet, and magnetic lines of force are created in the coil of insulated wire; a telephone diaphragm preferably, but it may be a plate of iron, is then held in such a manner that these invisible lines of force can impinge upon it, and it reproduces the note sounded by the tuning fork, although there is no visible connection between it and the disc-coil. In reality, the sound is heard only at the time of the make or break in the circuit, and the rapidity with which the make-and-break is made determines the pitch of the note. To a large extent that depends on the length of the arms of the tuning-fork, but with suitable arrangements that is so rapid there is no perceptible interval, and the telephone diaphragm, held within the influence of the lines of the disc-coil, reproduces with exactness the sounds due to the rapidity of the vibration of the tuning-fork. The discovery derives importance from the fact that, so long as the receiving diaphragm is held in such a position that these invisible lines of magnetic force can impinge upon it, a brick wall or two and many feet of air make no difference in the result, although there is no apparent connection whatever between the receiver and the transmitter.

THE ELECTRIC LIGHT AS A MOTH CATCHER.

DR. I. E. NAGLE, of Vicksburg, Miss., suggests the use of uncovered electric lights for killing the moths, *Aletia*, from whose eggs the destructive cotton worm is hatched. He believes that a few lamps properly placed would attract and destroy the moths, so as to protect a wide belt of cotton country. The plan would be well worth trying wherever electric lamps are in use. In some parts of the South planters have found that brush fires or burning rubbish will attract the moths in swarms; and every female moth promptly killed prevents the birth of many worms. Whether electric lamps would prove more efficient or economical only trial can determine.

PARTRICK & CARTER'S Telegraphic Specialties. PERFECTION AT LAST! The Acme Steel Lever Key.



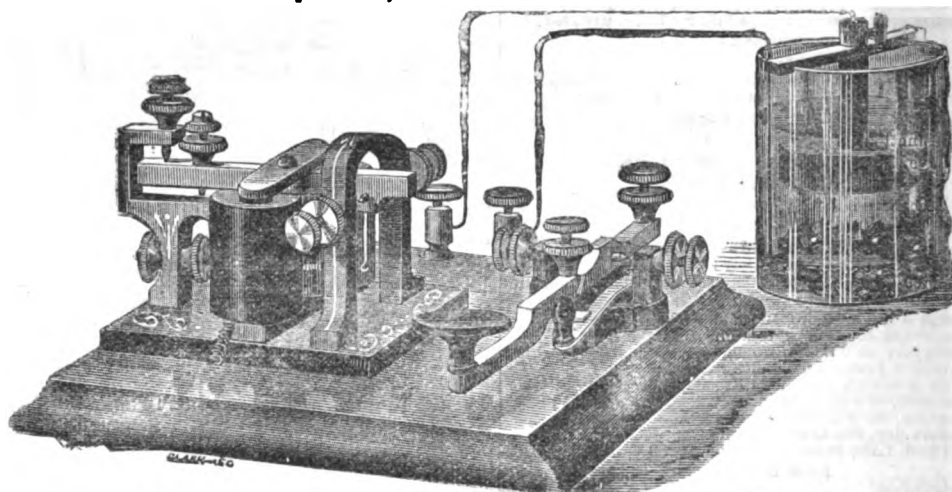
Price by mail, to all parts of the United States and Canada, \$3.00.

For beauty of design, lightness, easy working, durability, and for fast sending, surpasses all other keys ever made. This key has hard rubber base, with top connections, and is entirely nickel-plated, and has received the indorsement of hundreds of operators throughout the country as being the "perfection of all keys." Since the introduction of the "Acme" key every mail brings fresh evidences that the "Acme" is destined to be the most popular key ever placed before the telegraphic profession.

The New Giant Sounder Perfected. *Price, \$5 by mail.* Patented Feb. 16, 1875, and the only patent ever granted embodying the principle contained in the Giant Sounder, and which is absolutely owned and controlled by us. Buy from us and you will get the original.

The Champion Lightning Arrester and Cut-Out. *Price, \$1.25 by mail.* The Lightning Arrester, Cut Out and Ground Switch combined, of which we are the originators, has been extensively copied and imitated, BUT NEVER EQUALLED.

Premium Learners' Apparatus.
ONLY \$5.
Not The Cheapest, But Guaranteed The Best.



THE PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER PERFECTED," and the "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Callaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5, when the money accompanies the order.

These Instruments are the exact size and form of those upon which we received the highest award at the late Centennial Exhibition over all competitors. Everything reliable, and so guaranteed, or money refunded. Our Book of Instruction contains full and explicit information as to setting up the battery, running of wires, &c.

| | | |
|--|------------------|--------|
| Price, Complete Outfit..... | Money in advance | \$5.00 |
| " Instrument, without Battery..... | " " | 4.20 |
| " " wound with finer wires for lines of 1 to 15 miles | " " | 5.00 |
| " Cell of Battery, Complete..... | " " | .80 |
| " Premium Sounder, Separate Base..... | " " | 2.50 |
| " Premium Key, "..... | " " | 1.75 |
| " Premium Learners' Instrument, Key and Sounder entirely Nickel-plated, without Battery..... | " " | 5.20 |
| " Complete Nickel-plated Instrument, with Battery and Outfit..... | " " | 6.00 |
| " " Sounder, Separate Base..... | " " | 3.25 |
| " " " Key..... | " " | 2.00 |

Instruments without Battery, sent by mail, 55 cents extra.

Battery Jars cannot be sent by mail.

All orders will receive our prompt and careful attention. To prevent delay in shipment full shipping instructions with town, county and State, should be given. Remittances should be made by P. O. money order, registered letter, draft or express, which will insure safe delivery. Send for catalogues and circulars before purchasing elsewhere.

PARTRICK & CARTER,
Manufacturers of Telegraphic Instruments and Supplies,
114 South Second Street, Philadelphia, Pa.

A GREAT OFFER.

To Superintendents, Managers, Purchasing Agents
and others having on hand

Worn Out, Damaged or Useless Morse Keys,

We will, until further notice, furnish our

New Steel Lever Keys

in exchange for all old keys for a cash difference of \$1.66 each. This price applies to any number of keys, no matter in what condition the old ones may be. They must be delivered to us, in packages plainly marked KEYS, with all charges PRFPaid, and remittance should accompany the orders, except from Superintendent and Purchasing Agents of well-known Companies.

Now is the time, while the offer holds good, to get together all of your

Used-up and "Bad" Keys

and exchange them for splendid New Ones. See description and advertisement of Steel Lever Key. Send for circular.

J. H. BUNNELL & CO.,

112 Liberty Street, N. Y.

FREE!

Complete Instruction in Telegraphy

If you wish to know all about learning Telegraphy, constructing and operating Short Lines of Telegraph, &c., send your address, by postal card or letter, and get J. H. Bunnell & Co.'s Manual of Instruction for Learners of Telegraphy, latest edition, which we will send

FREE OF CHARGE,

to all who apply, by mail or otherwise.

It is the plainest and best book of instruction in Telegraphy ever published, being fully complete in description, explanation and illustrations.

J. H. Bunnell & Co.,

112 Liberty Street, N. Y.



Now Published Weekly.

Believing the time to have come when ELECTRICAL SCIENCE in AMERICA should be represented by a WEEKLY JOURNAL, and in response to a VERY WIDE-SPREAD DEMAND FROM SUBSCRIBERS, we are now publishing THE OPERATOR WEEKLY, instead of semi-monthly as heretofore.

The advancement in this important field has become so great and rapid that it is impossible for a journal published only twice a month to keep up with it.

No one who will compare the little four-page semi-monthly OPERATOR of eight years ago with the weekly OPERATOR of to-day, with its 24 pages, FILLED WITH VARIED AND INTERESTING MATTER, can say that it has not KEPT PACE WITH THE DEVELOPMENT OF ELECTRICAL SCIENCE during that period.

In issuing it more frequently, our aim will be to considerably FURTHER IMPROVE THE PAPER and, in fact, to make it so good that no one whose daily life is associated with electrical work can AFFORD to do without it; and while the paper shall not be any less entertaining than it has been hitherto, to give in addition to all the latest electrical news as it occurs, much more matter of PERMANENT VALUE than it was possible to do before, as well as to publish ILLUSTRATIONS AND DESCRIPTIONS OF NEW INVENTIONS and the like, PROMPTLY, WHILE THE SUBJECT IS FRESH.

Thus, in addition to the regular telegraphic articles we commenced in the October 21st number a series of THOROUGH, PRACTICAL AND UNUSUALLY CLEAR, CONCISE AND ABLE ARTICLES ON ELECTRIC LIGHTING. These articles are so COPIOUSLY ILLUSTRATED and written in so SIMPLE and EASY language that any ordinarily intelligent person—even though not an electrician—can from them gain a CORRECT KNOWLEDGE of the FUNDAMENTAL PRINCIPLES ON WHICH ELECTRIC LIGHTING IS BASED. This subject is somewhat of a mystery to many, but is a very important one at the present time, and is NOT AT ALL DIFFICULT TO UNDERSTAND, if these articles which will run for some little time, are carefully studied.

Electric Lighting promises to prove as important an outgrowth of telegraphy as telephony has already done therefore every telegraph man—especially every young man connected with the business—ought to read these articles.

To any who may be unacquainted with THE OPERATOR, we would say that the paper is now in its THIRTEENTH VOLUME. It is devoted to

Telegraphy, Telephony, Electric Lighting and Electricity in general, and aims to thoroughly cover each of these important fields.

It is carefully edited in every department, and has able correspondents at all important centres of information in the United States, Canada and abroad.

Its contents may be briefly described as a CURRENT HISTORY OF ELECTRICITY in its many and diverse applications, and it should be in the hands of every one connected with the telegraph business.

It is a PERFECTLY INDEPENDENT JOURNAL and has never hesitated to denounce wrong-doing or abuse of power, wherever it has found them, no matter what the position of the offender.

The extremely low subscription price puts the paper within the reach of all.

Subscription, in Advance.

One Year (52 Numbers), Postage Prepaid, \$2;
Six Months, \$1; Three Months, 50c.

To those Subscribing for 1883, we will send the copies for the present year, from the receipt of their subscriptions, FREE. Thus \$2.00 will pay for a copy of every issue weekly from the receipt of the subscription until DECEMBER 29th, 1883.

For \$2.25 we will send the copies from the issue the paper became a weekly, October 14, 1882, until that of December 29, 1883. This will give all the numbers containing the electric light articles.

Sample copies of THE OPERATOR and circulars of the telegraphic and electrical books we publish or sell mailed free on application.

Take advantage of the above opportunity of getting 6 or numbers free; or if you prefer, send \$1.00 for 6 months, or even 50c. for three months on trial.

Remit by P. O. Order, draft, registered letter or express. U. S. postage stamps taken. Address,

W. J. JOHNSTON, Publisher.
No. 9 MURRAY STREET, N. Y.

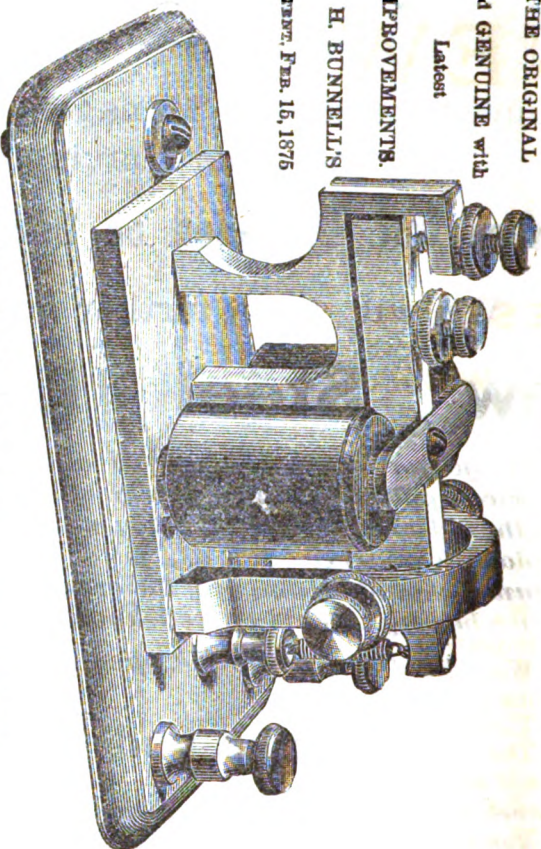
Another Great Reduction in Prices ! !

THE ORIGINAL
and GENUINE with
Latest

IMPROVEMENTS.

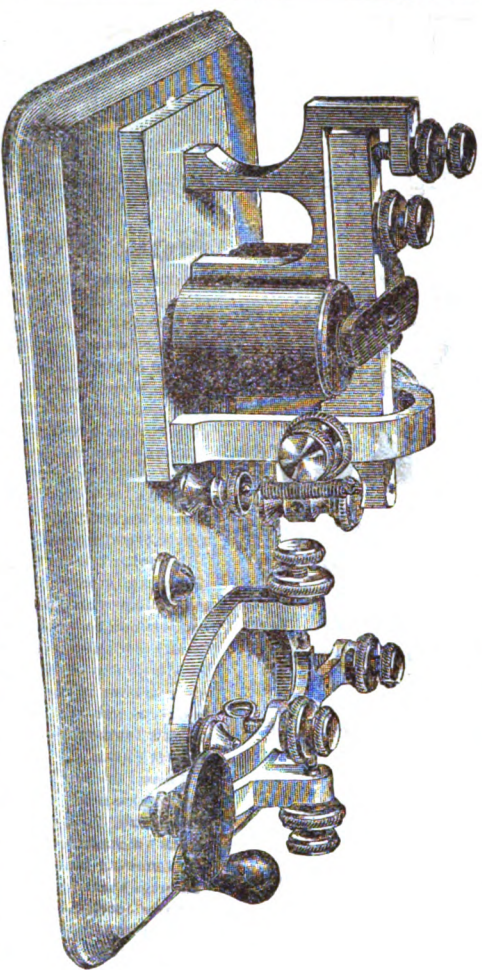
J. H. BUNNELL'S

PATENT, FEB. 16, 1875



THE GIANT SOUNDER—UNEQUALLED! \$4.00.

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$4.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

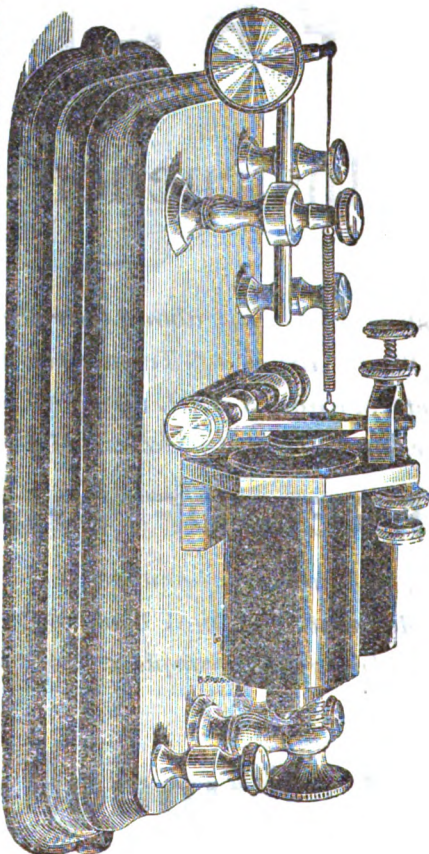
COMBINATION SET: \$7.50.

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$7.50, carefully boxed and sent by mail, prepaid, to any part of the United States.

All of these prices subject to liberal discount on orders in quantity.

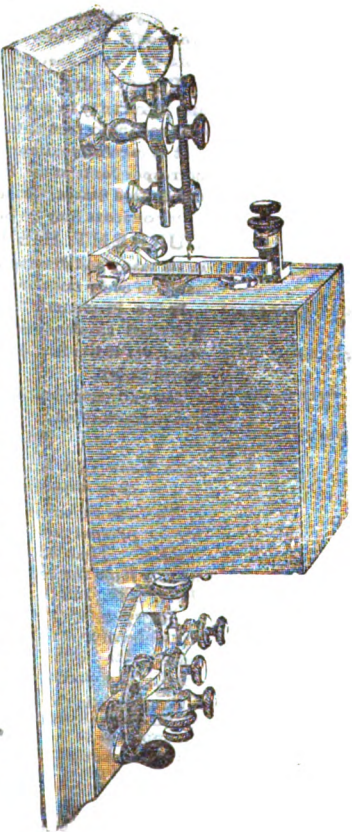
J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.

\$7.50.



FIRST CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Subbase, Extension Adjustment. Price, \$7.50.



\$11.00.

BOX SOUNDING RELAY AND STEEL LEVER KEY.

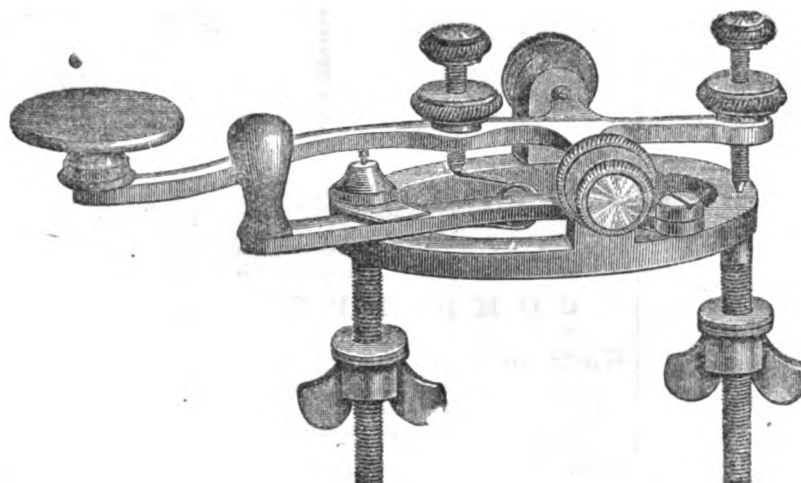
COMBINATION SET.

or Main Lines up to 600 miles in length. Of best construction for loud, clear sound without wear sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire Price, with Steel Lever Key on base, \$11.00; without Key, \$8.50

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

**BEST IN THE
WORLD.**



**PATENTED Feb. 15
1881.**

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:


The Lever is *only one-half the weight* of the ordinary brass lever as generally made.


The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

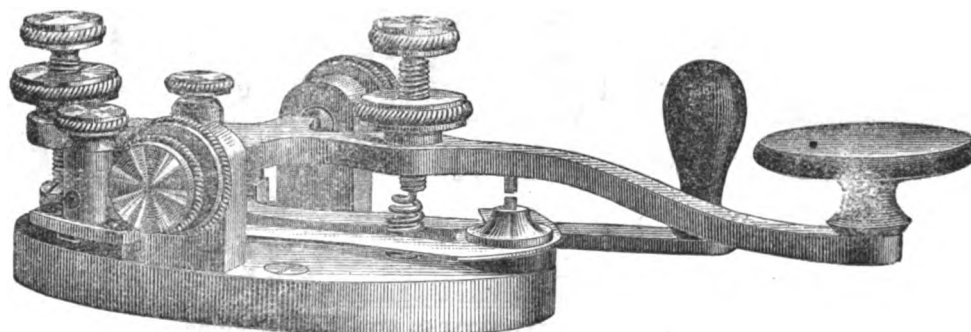
PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Company Supply.

 *Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.*

 **NOTICE.**—Beware of the absurd attempts at imitation of these Keys which continue to be put forward from various sources. The BUNNELL STEEL LEVER KEY is the **ONLY ONE** having the **SOLID TRUNNION**, together with **ALL** the other merits of beauty and perfection which have caused it to be adopted everywhere as **THE BEST KEY IN THE WORLD.**

Legless Pattern Steel Lever Key.



A Beautiful and perfect Key suitable for Use on Fine Desks, or wherever a Legless Key is preferable. **PRICE**, carefully boxed, and sent, prepaid, by mail, to any part of the United States, \$3.50.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

CHARLES WILLIAMS, JR.,

(ESTABLISHED IN 1858.)

109 COURT STREET, BOSTON, MASS.,

Authorized Manufacturer of

THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells, District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS,

Batteries, Wire, Insulators and

Telephone Supplies of Every Description.

GEO. WASHINGTON, JR., Pres. ROBERT PITCAIRN, Treasurer.

O. H. JACKSON, Vice Pres't and Gen'l Manager

ABRAHAM T. ROWLAND, Secretary. HENRY NYDER, General Agent,

THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of The Interlocking Switch and Signal Co., of Harrisburg, Pa. Sole Owners and Manufacturers of the only practically successful

SYSTEM OF OPERATING RAILROAD SIGNALS AUTOMATICALLY.

Also of Apparatus for Operating and Interlocking Switches, signals and Gates by Levers, Hydraulics, Pneumatics or Electricity,

Also, Manufacturers of Frogs, Crossings, Switches and Switch Stands.

Plans, estimates and detailed descriptions, together with references to apparatus in practical operation, will be furnished upon application

OFFICE AND WORKS:

Corner Fayette Street, Garrison Alley and Duquesne Way.

ZUCCATO'S PAPHYROGRAPH

ADOPTED BY
THE
GOVERNMENT



Prints Black, Violet, or Red, from the original writing, Autograph Fac-simile Circulars, Prices Current, Music, Drawings, School Examination Papers, etc., in a common copying press, at the rate of 500 per hour. The most rapid, simple, and economical process known 1000 to 5000 printed from a single writing. The Simmons Hardware Co., of St. Louis, says of it: "Our Papyrograph, purchased some time since, gives entire satisfaction. Would not be without it for \$1,000 a year." For specimens of work, price-list, etc., address, with stamp, THE PAPHYROGRAPH CO., 41 to 45 SHUTCHETT STREET, NORWICH, CONN. Local Agents wanted.

TO INVENTORS.

I make a specialty of taking out patents for

ELECTRICAL INVENTIONS.

References and full information by mail on request.

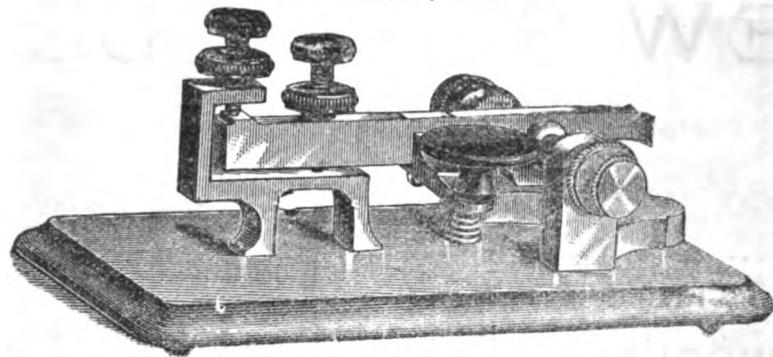
W. B. HALE, Solicitor of patents.

Former First Ass't. Examiner in charge of Class of Electricity, U. S. Patent Office. Office: No. 617 Seventh St., Washington, D. C.

Printed copies of any patents, with drawings, sent for net cost, ten cents each, and a one cent postage stamp.

NEW MECHANICAL TELEGRAPH INSTRUMENT.

PATENTED APRIL 4, 1882.



COMBINED KEY AND SOUNDER.

NO BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is always ready for use.

Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or registered letter.

J. H. BUNNELL & CO., Telegraph and Telephone Supplies,
112 Liberty Street, New York.

**HAVE YOU RECEIVED
—ONE OF—**

J. H. BUNNELL & CO.'S

NEW, LARGE,

ILLUSTRATED CATALOGUES OF MAY, 1882?

If not, send your address by postal card or letter and you will get one by return mail. It contains Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instruments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.



The Works of the JNO. A. ROEBLING SONS CO., at Trenton, N. J., have facilities for producing large quantities of Telegraph Wire on short notice. The Bell system of rolling long lengths of wire rods, and improved methods of galvanizing, were first introduced in the United States at these works. It insures the production of wire with few joints, and a thick coating of zinc.

Western Electric Company,

Factories at
CHICAGO,
NEW YORK,
and INDIANAPOLIS.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES,

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANSON STAGER, *President.*

ENOS M. BARTON, *V.-President.*

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES | PRICE |
|---|-------|-------|
| I—Complete Set of Catalogues..... | 206 | 40c |
| II—Telegraph Instruments and Supplies | 64 | 5c |
| IV—Insulated Wire (Included in II) | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 33 | 5c. |
| VI—Electro-Medical Apparatus..... | 33 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 33 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 5c. |
| XI—Magnets for Mills..... | 20 | 5c. |
| Sir Wm. Thomson's Nautical Instruments.. | 24 | 5c. |

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FURNISHING

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE

MAGNET WIRE

PATENT RUBBER-COVERED WIRE

BURGLAR ALARM AND ANNUNCIATOR WIRE

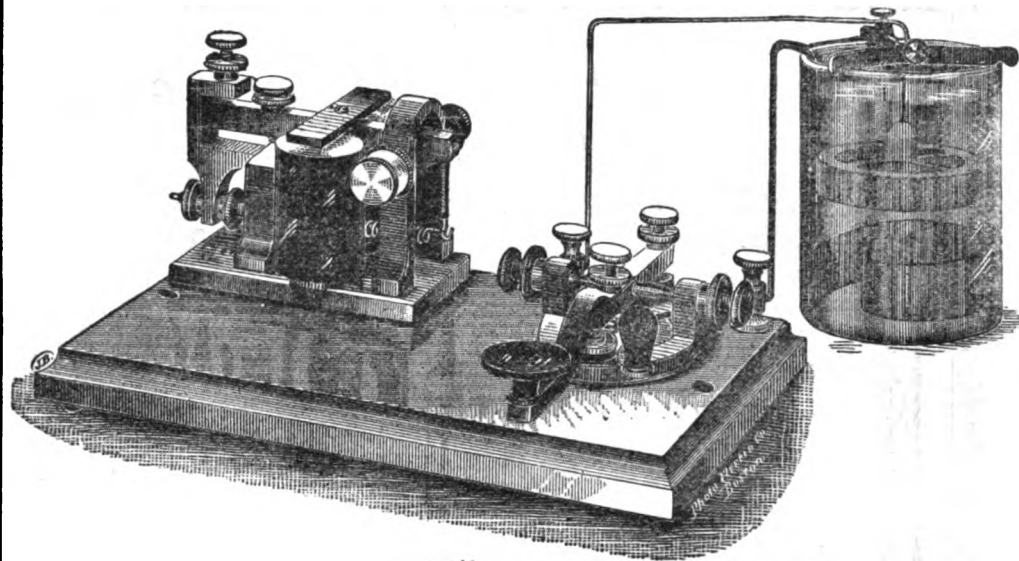
LEAD-ENCASED WIRE, CABLES, ETC.

OFFICE AND FACTORY: 57 STEWART STREET.

(PROVIDENCE, R. I.)

W. H. SAWYER Electrician and Sign

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



Price for the Complete "Gem" Learners' Outfit. \$3.75.

Consisting of the above large sized Sounder and Key, a large Cell of Callaud Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low priced Learners' Instrument that has nicely finished BRASS Sounder and Key Lever, with perfect adjustments for both.*

| | | | | | |
|---------------------------------|---|---------|---|--|---------|
| Price for Complete Outfit | | \$3. 75 | Price for Instrument alone, by mail, post-paid. | | \$3. 60 |
| " | Instrument alone | 3 06 | " | Instrument alone, for lines 1 to 15 miles | 3. 60 |
| " | the whole outfit (except Glass Jar) with Key and Sounder separate, by mail post-paid..... | 4 32 | " | Instrument alone, for lines 1 to 15 miles, by mail, post paid..... | 4 05 |

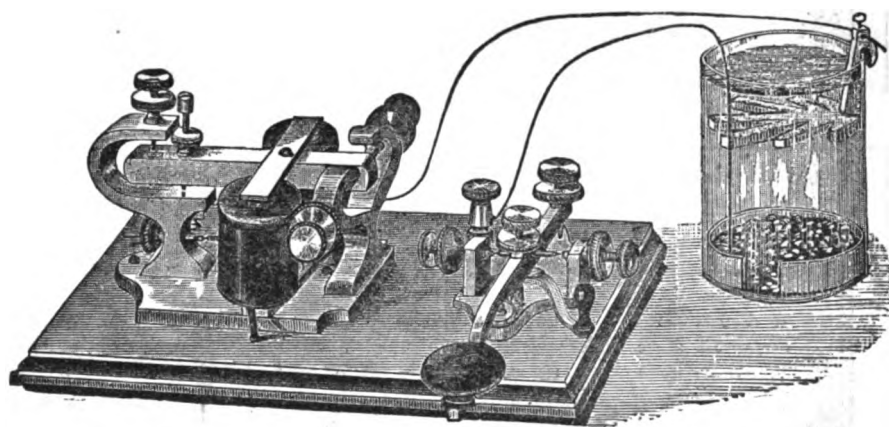
Send for Circular.

JEROME REDDING & CO.,

Manufacturers of Telegraph and Electrical Supplies,
No. 30 Hanover Street, Boston, Mass.

30 DAYS TRIAL. LITTLE GIANT FRENCH BATTERY.

Endorsed by the most eminent Physicians for the cure of Operators Cramps, Rheumatism, Neuralgia, and all Nervous Diseases and Weakness. Every Operator should have one. A. B. Cameron, of Piedmont, Wyo., says: "I have successfully managed to remove Rheumatism from my left knee to my left shoulder, and from my shoulder it is now gone to Paris unknown to me, with the use of your 'Little Giant' Battery." Rent by express subject to inspection. Price complete, \$4.00. Send for Circular. AGENTS WANTED. C. E. Jones & Bro., 4th & Walnut Sts., Cincinnati, Ohio.



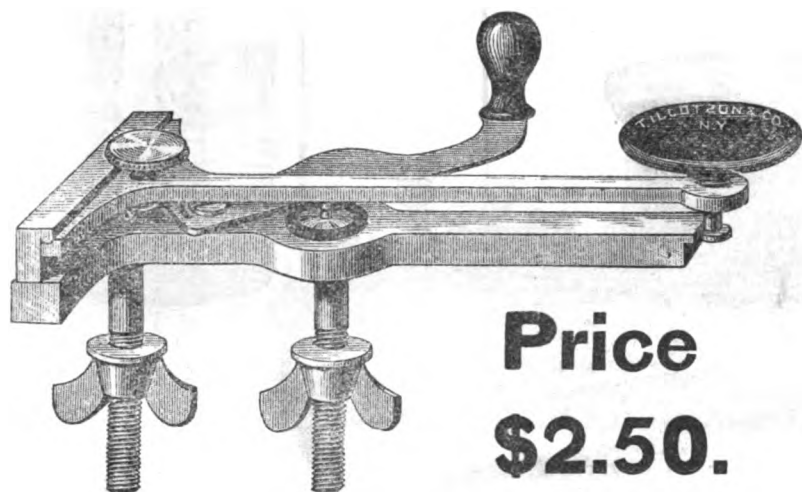
No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of: Sounder, Key, either on 1 base or separate, 5x7, Callaud Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent C. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

This Key has Pure Platinum Points.

A. B. LYMAN, 36 South Water St., Cleveland, O.

THE "VICTOR" TELEGRAPH KEY.



**Price
\$2.50.**

PATENT APPLIED FOR.

*The Greatest Improvement in Telegraph Keys
ever made.*

THE EASIEST WORKING.

THE MOST POSITIVE CONTACT.

The Lightest Lever.

The Most Perfect in Construction.

No Trunnion Connections.

No Side Motion to Lever.

No Back Adjusting Screw.

The Neatest, Nicest, Handiest and Best Key
in the World.

Since the earliest days of Morse Telegraphy there has been little or no radical change in Telegraph Keys until the invention of the Victor Key.

Telegraphers who take hold of the "Victor" Key will at once notice that there are but two points of adjustment to regulate. These are the play of the lever and the stiffness of the spring. There are no loose trunnions to tighten up, and no tight trunnions to loosen. The lever can never move to one side or the other; and the point can never be worn into wedge shape. The play of the lever must of necessity be directly up and down, without side motion; and consequently the points must always strike fairly and squarely. The imperfect trunnion connections of all old style keys are completely done away with in the "Victor," and the five minutes' labor of the "relief" operator in twisting adjustment screws to get his key lever to work "to suit" are at once ended. These are the most prominent points that will present themselves to the Telegrapher who uses the "Victor" key for the first time. Add thereto the light **STEEL** lever, which also prevents wearing of the connection, and the long leverage, and you have the two leading advantages claimed for the most perfectly improved of modern telegraph keys. By a turn of the knob to the left the play of the lever is decreased, or by a turn to the right it is increased, thus avoiding the imperfect set screw adjustment heretofore universally in use. These advantages present themselves so clearly and emphatically to every telegrapher that this key has only to be tried to receive the commendation already universally accorded it by every telegraph man who has examined it, which is "THE BEST KEY I EVER SAW."

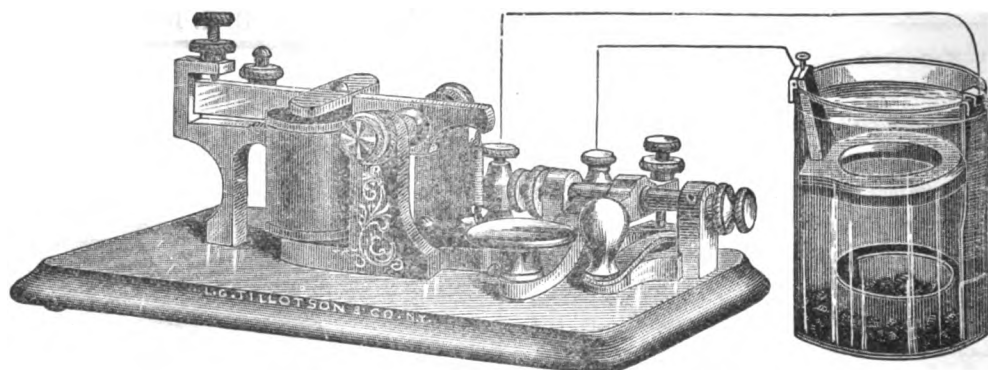
To enable all to test the merits of this great invention, we will, on receipt of price, \$2.50, send, post-paid, by registered mail, to any part of the United States or Canada, a sample VICTOR KEY.

VICTOR KEY mounted on highly polished Hard Rubber Base, with Top Connections, \$3.00, post-paid.

\$3.75. Great Reduction in Price \$3.75.

OF THE CELEBRATED

HOME LEARNERS' TELEGRAPH INSTRUMENTS



Owing to the great demand for these popular instruments, we have been compelled to enlarge our facilities for their production, and are now making them in such quantities as to admit of a considerable reduction in price, which reduction we now give our customers the advantage of. All of these Instruments will be manufactured as heretofore in the best manner, and they will be found the best Student's Apparatus in the market.

For the above Complete and Perfect Sounder and Key Combined, on mahogany base, including Battery, Chemicals, Wire, Book of Instruction and everything necessary for a first-class Telegraph Outfit for the Student's use, for practice at home, or for operating all Short Lines of Telegraph, net cash..... \$3.75
Instruments for short circuit, without Battery..... 3.00
Same by mail, post paid..... 3.50

Instruments without Battery, wound with fine wire, for lines 1 to 15 miles..... \$3.75
Same by mail, post-paid..... 4.25
Cell of Battery..... .65
Instruction Book..... .30
Galvanized Telegraph Wire, per 100 feet..... .30
Remit by Postal Money Order, Draft or Registered Letter,

MANUFACTURED ONLY BY

L. G. TILLOTSON & CO.,

Manufacturers and Dealers in TELEGRAPH AND TELEPHONE SUPPLIES of Every Description,
Nos. 5 and 7 Dey Street, New York.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT 157.—October 2, 1882.

MOSES W. STOLL.

MOSES W. STOLL, killed on a handcar, in railroad accident near Waco, Texas, February 7, 1882. His certificate, No. 3497, was issued February 28, 1879.

One dollar is due to meet this assessment from member holding Certificates up to and including No. 4064.

Insurance expires Oct. 30, 1882; Membership, Nov. 30, 1882.

The number of members of the Association in good standing is: 1st Division, 2303; Second Division, 138.

Net increase in membership, first Division, since last assessment: 32.

ASSESSMENT 158.—October 31, 1882

CHARLES B. NOYES.

HENRY O. MAYNARD.

CHARLES B. NOYES died in New York City, September 26, 1882, of Aneurism of the Aorta. His certificate, No. 3081, was issued August 17, 1877.

The above claim will be paid from surplus.

HENRY O. MAYNARD died at Geneva Lake, Wis., October 20, 1882, in a Congestive Chills. His certificate, No. 2957, was issued April 13, 1877.

One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4293.

Insurance expires Nov. 30, 1882; Membership Dec. 31, 1882.

The number of members of the Association in good standing is: 1st Division, 2324; Second Division, 139.

Net increase in membership, First Division, since last assessment: 21.

BY-LAWS—SECTION VIII. "Upon the death of a member of the Association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and in case payment shall not be made within 30 days thereafter, the delinquent shall forfeit all claim to the benefits of the Association; and should payment not be made within 60 days, shall forfeit membership to which said delinquent can only be restored as provided in Section VII. of these By-Laws."

A. R. BREWER,

Secretary,

NEW YORK.

P. O. Box. 3175

KERITE INSULATED

TELEGRAPH WIRES AND CABLES.

KERITE IS INDESTRUCTIBLE.

AFTER YEARS OF THE EVEREST TESTS IT IS ADMITTED TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by all the leading men in the telegraphic profession.

THE

DURABLE QUALITIES OF KERITE

RECOMMEND IT AS THE

CHEAPEST AND MOST ECONOMICAL

Insulator for all telegraphic purposes.

OFFICE, AERIAL, SUBMARINE AND UNDERGROUND

CABLES

of any number of conductors or size of insulation, furnished at short notice.

INSULATED WIRE

of all sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic material.

For further particulars address,

A. G. DAY,

Sole Patentee,

120 BROADWAY, NEW YORK.

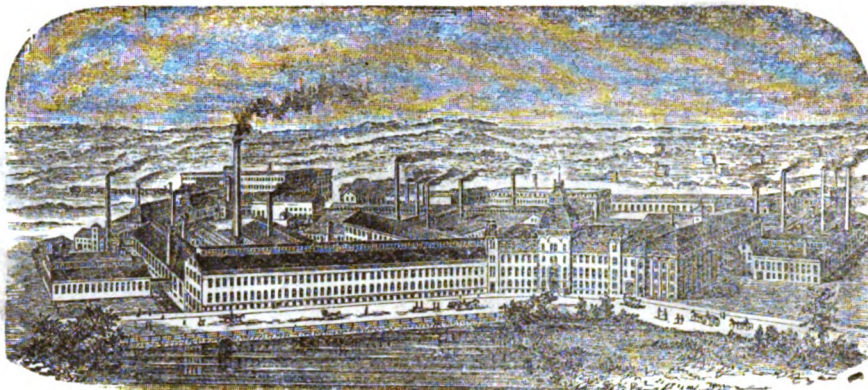
J. B. HOTCHKISS, General Agent.

TELEGRAPH WIRE.

TELEPHONE WIRE

WASHBURN & MOEN MANUFACTURING COMPANY.

ESTABLISHED 1861. CAPITAL \$1,500,000.



WORCESTER, MASS.

21 CLIFF STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequalled in that particular.

Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,

PATENT CONTINUOUS GALVANIZING BATH,

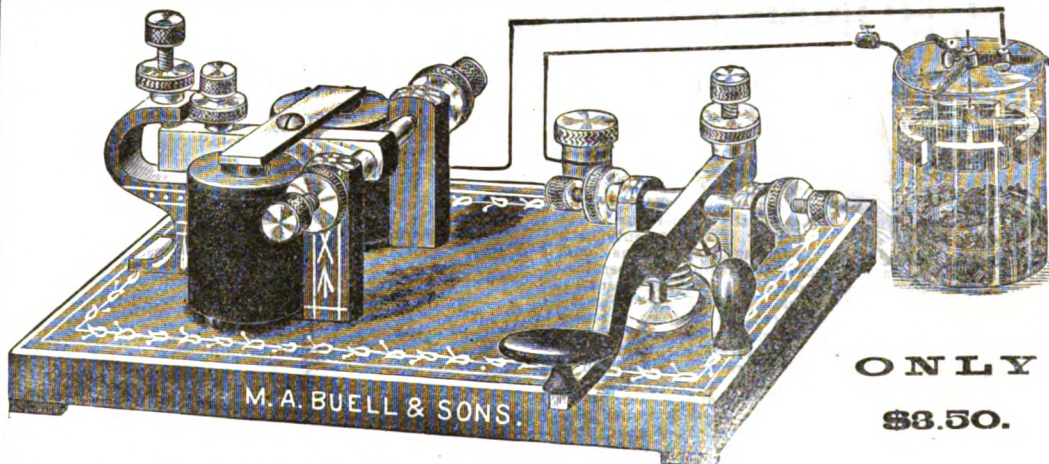
AND THE BELGIAN ROLLING MILL,

(In connection with the DOUBLIN STEEL FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application.

N. B.—The qualities known as Extra Best Best (A. B. B.) and Best Best (B. B.), kept constantly in stock.

ONLY
\$3.50.

THE STAR INSTRUMENT, guaranteed to be Perfect and good for 5 miles or less.

Outfit, including Wire, Vitriol, Book, etc., cash with order, - \$3.50

Outfit, without Battery, cash with order, - - - - - 3.00

Outfit, without Battery, sent by mail for - - - - - 3.50

M. A. BUELL, 144 Superior St., Cleveland, O.

General Dealers in all kinds of Telegraph Supplies.

FREE TO YOU

By Mail, on receipt of 25c. in currency or stamps,
HOW TO BECOME A TELEGRAPH OPERATOR. The most complete illustrated
Telegraph Instruction Book in the world.

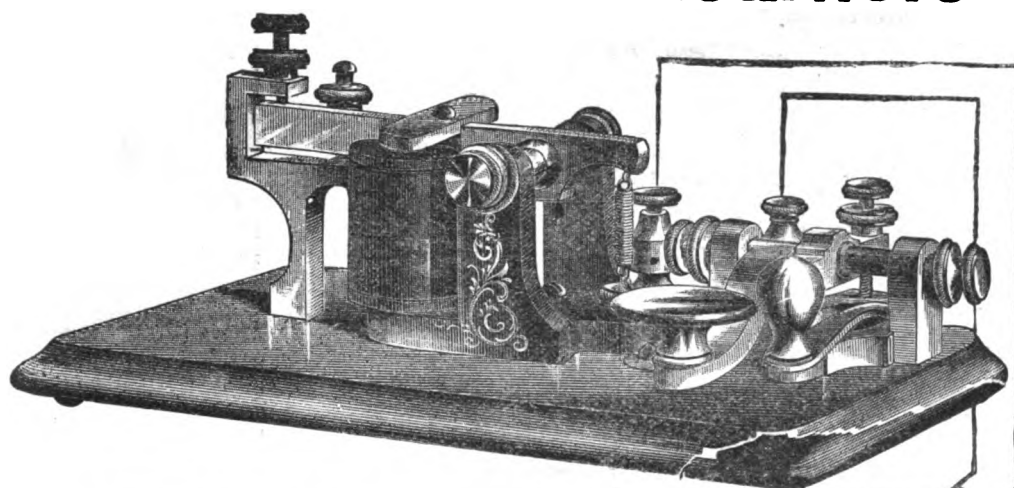
C. E. JONES & BRO.: Dear Sirs:—Instruction Book received O. K., and many thanks. It is worth five times what it cost. If a person could not learn to be an operator after studying it, THEY HAD BETTER GIVE UP. Yours truly,
A. L. JAMES, Tipton, Tulare County, Cal.

NOW! RIGHT! NOW! while fresh in your mind, is the best time to send your order, before you misplace this paper and forget our address, and your opportunity is gone.

C. E. JONES & BRO.,

MANUFACTURERS AND DEALERS IN
Telegraph, Telephone and Electrical Supplies,
No. 51 West Fourth Street, CINCINNATI, O.

The "Morse" Learners' Outfit \$3.75.



THE BEST.

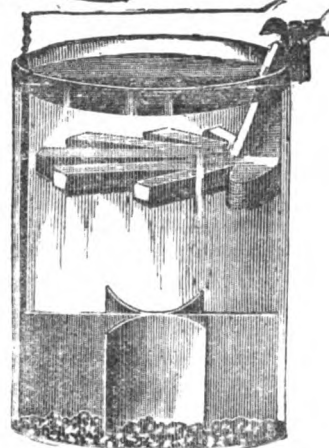
Price, \$3.75, complete with Battery, Book of Instruction, Wire, Onemicals, and all necessary materials for operating. "Morse" instrument alone, without battery..... \$3.00
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 3.75
 Cell of battery complete..... .65
 "Morse" Learners' instrument, without battery, sent by mail..... 3.50
 (Battery cannot be sent by mail.)

Instruction Book FREE.

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



GREAT REDUCTION IN PRICE !! THE BEST.

The "Morse"

Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners, Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED! You are SURE of getting THE BEST THAT IS MADE IF YOU SELECT THE "MORSE."

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.



YOUR NAME

finely printed on 16 Bevel Gilt-edge Cards, with a small key, or Lightning from a clenched fist, or Pipe in with Envelope and the words "Telegraph" and "73," or a small and perfect engine engraved upon the upper turn-down corner, 16 for 25 cents, or 75 with assorted designs, with name, and business address, for \$1.00; sample of operators' cards, 10 cents; one morocco card case, two pockets, 10 cents. 15 Laughable Flirtation Cards, including Handkerchief, Fan and Glove Flirtation, 10 cents. 15 tinted portraits of actresses, 10 cents. 15 Komical Advertising cards, awful funny, 10 cents. 50 Transparent picture cards, new subjects, with your name, 20 cents. One cabinet full size French Photograph of Actress, 10 cents. These are perfect beauties \$1.00 per dozen, assorted, the same that others charge 25 and 35 cents each for. Agents wanted to receive orders for the finest and largest assortment of visiting cards, French and American chromo cards in the United States all put up in fine book form, with full instructions, postpaid, for \$1.00. Agents allowed 25 per cent. of selling prices. 10+ business cards furnished with every outfit. Give your name and address plain so that there will be no mistake since I started in the card business in 1870 this year's outfit goes far ahead of all.

5 CENT SHEET MUSIC.

I am prepared to furnish all the latest and popular pieces of the day for only five cents each. Full sheet music size, and the same in every respect that sells for 30 and 75 cents each, that being the price printed on the music. Catalogue of over 500 pieces for 3-cent stamp, or 10 cents for two pieces and catalogue, as two or more will cost no more by mail than one. 25 pieces for \$1.00, postpaid. Everybody wants Over the Garden Wall, When the Leaves Begin to Fade, Oscar Wilde Galop, Jumbo March &c., &c. Agents can make money fast by ordering a large assortment to select from, especially in small towns where there is no music sold. Address, F. F. MUNN, CLYDE, Wayne Co., N. Y.

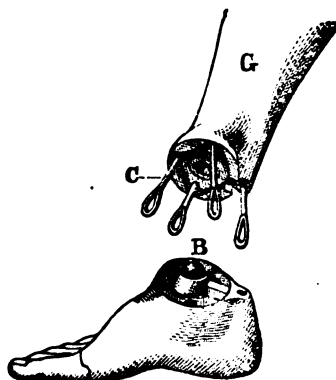


CALIGRAPHS SOLD and orders filled immediately.

STENOGRAPHERS furnished business men without charge for my services.

SHORTHAND TAUGHT. Send for circular to

W. G. CHAFFEE,
Oswego, N. Y.



THE CELEBRATED BLY

ARTIFICIAL LIMBS. With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet. GEO. B. FULLER, Successor to Dr. D. BLY, Rochester, N. Y.

Found at Last.

A CHEAP

COUNTER CLIP,

(Patented July 18, 1882.)

CHEAPER THAN PASTE.

Blanks Removed Without Tearing.

Price, post-paid, 15 cents. Per doz., post-paid, \$1.50. Discounts to the Trade or to Telegraph Co.s, in quantities. Larger sizes made on screw to wall, for Paper Bags, Wrapping Paper, &c. Circulars free. Address,

W. W. PRICHARD,
Ironton, Ohio.

SHORTHAND Writing thoroughly by mail or personally. Situations procured for pupils when sent back and for circular. W. G. CHAFFEE, Oswego, N. Y.

I will teach any operator the Corresponding Style of Phonography, who will sell a Calligraph for me

HALBERT E. PAINE, late Comm'r Patents. STORY B. LADD,

PAINE & LADD,

Solicitors of Patents and Attorneys in Patent Cases, Washington, D. C.



We continue to act as solicitors for patents, caveats, trade-marks, copyrights, etc., for the United States, and to obtain patents in Canada, England, France, Germany, and all other countries. Thirty-six years' practice. No charge for examination of models or drawings. Advice by mail free.

Patents obtained through us are noticed in the **SCIENTIFIC AMERICAN**, which has the largest circulation, and is the most influential newspaper of its kind published in the world. The advantages of such a notice every patentee understands.

This large and splendidly illustrated newspaper is published **WEEKLY** at \$3.20 a year, and is admitted to be the best paper devoted to science, mechanics, inventions, engineering works, and other departments of industrial progress, published in any country. Single copies by mail, 10 cents. Sold by all news-dealers.

Address, Munn & Co., publishers of Scientific American, 261 Broadway, New York. Handbook about patents mailed free.

JOURNAL OF THE TELEGRAPH

VOL. XV.

NEW YORK, DECEMBER 20, 1882.

WHOLE NO. 354.

QUARTERLY REPORT OF THE WESTERN UNION TELEGRAPH COMPANY, FOR THE QUARTER ENDING DECEMBER 31, 1882.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, December 13, 1882.

The following statement will show the condition of the Company at the close of the quarter ended September 30, 1882:

| | |
|--|----------------|
| Surplus, July 1, 1882, as per last quarterly report..... | \$1,664,240 13 |
| Net revenues, quarter ended September 30, 1882..... | 2,289,489 01 |
| | \$3,953,729 14 |

From which deducting appropriations for—

| | |
|--|----------------|
| Dividend of 1½ per cent., paid October 15..... | \$1,199,781 81 |
| Interest on Bonded Debt..... | 104,850 00 |
| Sinking Funds..... | 20,000 00 |
| | \$1,324,631 81 |

Less portion of the Sinking Fund for the bonds of 1900 (which was set aside previously) returned to the Company by the Union Trust Co., trustees, because of the drawn bonds not having been presented for redemption.....

40,000 00

\$1,284,631 81

Leaves a surplus, October 1, 1882, of.....\$2,677,097 33

The net revenues for the quarter ending December 31, instant, based upon nearly completed returns for October, partial returns for November, and estimating the business for December, will be about.....\$2,150,000 00

Add surplus, October 1, as above.....2,667,097 33

\$4,817,097 33

From which appropriating for—

| | |
|------------------------------|--------------|
| Interest on Bonded Debt..... | \$104,850 00 |
| Sinking Funds..... | 20,000 00 |
| | \$124,850 00 |

Leaves a balance of.....\$4,692,247 33

It requires for the payment of a dividend of 1½ per cent. on the Capital Stock.....\$1,199,800 00

Deducting which, leaves a surplus, after paying dividend, of.....\$3,492,447 33

Respectfully submitted,
NORVIN GREEN,
President.

On motion, the following resolutions were adopted, to wit:

In view of the statements submitted—

Resolved, That a dividend of one and one-half per cent. from the net earnings of the three months ending December 31, be, and is hereby declared paya-

ble on the 15th day of January next, to stockholders of record, at the close of business on the 20th day of December, instant.

Resolved, That, for the purpose of such dividend, the stock books of the Company be closed at three o'clock on the afternoon of the 20th day of December, instant, and be re-opened on the morning of the 16th of January next.

CONSTANT BICHROMATE BATTERIES.

To the Editor of the Journal of the Telegraph:

THE matter of rendering galvanic batteries in which "bichromate solution" is used constant in action, without introducing a porous cell which so largely increases the internal resistance, has received considerable attention and many devices have been proposed and tried to effect such purpose, among which have been keeping the liquid boiling, changing solutions with syphons or by overflow, motion of plates, automatic stirrers, &c. The following method I have used about five years, it may be interesting and possibly of utility to experimenters, and as the same method is applicable to other forms of battery besides bichromate cells. I have named such *Vortex Batteries* as a convenient designation (indicating a method.)

Take a battery jar of any designated size. Cast the zinc in form of a hollow cone, of varying thickness, cast with a ledge or collar, which rests all around on the edge of the jar forming a heavy and tight cover. The thickness depends on the size of battery made, a usual thickness is 1-20th of an inch at the collar and one half an inch at the point of the cone, depending of course upon the size of the battery being constructed.

The zinc is thoroughly amalgamated and the inside hollow of the cone is well coated with gas fitters cement (wax, resin and venetian red), which resists acid very well; bore a small hole through the apex of the cone and insert a small glass tube through the apex of the cone projecting a quarter of an inch below the point, but flush with the cemented surface inside the hollow.

The carbon is a plate at the bottom of the jar laid flat and well secured to a sheet of lead on its under side by tongues in the lead and then well cemented to prevent injurious contact on its under surface and a lead strip also cemented, leading out and up to the proper screw cup above the zinc collar insulated from zinc by ordinary means, a proper slit being cut in the collar for that purpose. The other screw cup is attached to the opposite side of the jar into the collar on that side.

To set up the battery: Put the carbon in place at the bottom, charge the jar with sulphuric acid and water—usual proportions. Set in the zinc cone so the slit in the cellar receives the cemented lead strip of the carbon, and its screw cup falls in its proper place just over the collar. The liquid rises through

the tube into the cemented hollow of the cone at the top.

Put a quantity of bichromate salt in a small cloth bag and lay it in the liquid in the hollow of the cone. A stream of red liquid now appears falling from the glass tube down the center of the jar through the rest of the liquid to the carbon plate at the bottom, its gravity being greater than the clear liquid, the battery goes to work at once and furnishes a powerful and steady current for hours. Its internal resistance is very low. The reason of its steady action can be seen, as the falling red liquor creates in the rest of the liquid a *vortex* current which continuously forces the acid up against the zinc, and so long as any working acid is in the liquid or salt in the top, the current flows with great uniformity.

The object of the short piece of glass tube is to prevent the hole in the point of the cone becoming enlarged, which it was found to do without it.

A cover is added to prevent evaporation—to stop it at any time without disconnecting or disturbing, simply take out the bag of crystals of bichromate and put it in a convenient tumbler alongside. The action soon stops from polarization as usual, a plug to stop the flow inserted at the upper end of the tube answers a like purpose.

J. MILTON STARNES, JR.

THE EFFICIENCY OF INCANDESCENT ELECTRIC LAMPS.

A committee, consisting of Prof. George F. Barker, of Philadelphia; William Crookes, of London; and others, made a series of experiments on the incandescent electric lamps exhibited at Paris last year. The following are the conclusions reached after elaborate tests, as given in the report of the committee:

1st. The maximum efficiency of incandescent lamps in the present state of the subject, and within the experimental limits of this investigation, can not be assumed to exceed 300 candle-lights per horse-power of current.

2d. The economy of all lamps of this kind is greater at high than at low incandescence.

3d. The economy of light-production is greater in high resistance lamps than in those of low resistance, thus agreeing with the economy of distribution.

4th. The relative efficiency of the four lamps examined, expressed in Carcel burners of 7.4 spermaceti candles each, produced by one horse-power of current, is as follows: (A) At 16 candles: Edison, 26.5; Swan, 24; Lane-Fox, 23.5; and Maxim, 20.4. (B.) At 32 candles: Edison, 41.5; Lane-Fox, 37.4; Swan, 35.5; and Maxim, 32.4. To double the light given by these lamps, the current-energy was increased, for the Maxim and Lane-Fox lamps, 26 per cent.; for the Edison lamp, 28 per cent.; and for the Swan lamp, 37 per cent.

We must conclude that our sunlight is a true "electric light." We are justified also by analogy to conclude that each stellar world possesses an atmosphere and that the functions of all atmospheres are the same as those of our own; i. e., that of heating, lighting and sustaining all life, animal and vegetable. It is therefore no far-fetched conclusion that the planetary spheres, and even the great solar sphere, are both habitable and inhabited.

THE RATIONALE OF THE UNIFORM PLANES OF THE PLANETARY ORBITS.

It is rational to assume that the uniformity of the planes of the planetary orbits is due to some fixed and exact force acting in unison between the sun and its satellites. What can be the force that thus holds them all in one and the same plane; and why do not certain ones among them revolve above and others below that plane? Electricity and magnetism are two forces that act upon each other, *not in straight lines*, as all other forces are known to do, but in a *rectangular direction*; and bodies invested with electricity, or conduits of an electric current, tend to place magnets at right-angles to them, and conversely, magnets tend to place bodies conducting electricity at right-angles to them. The electric sun-current is strongest along the line of the equatorial diameters of sun and satellite, and tends to hold the magnetic axis of each satellite at or near right-angles with that current. In this fact we find the philosophy of the uniform plane of the planetary orbits

INTER-STAR SPACE.

Inter-stellar space is to be considered in the solar economy.

It is hardly to be credited by philosophic minds, that ponderable matter exists in space, outside of the influence of gravity, and following the attraction of the nearest stellar system; that it has by any possibility escaped from the power of gravity, having once been under its control. The body, or substance capable of floating loose in space, must have originated in some sphere; it could not otherwise have had an existence; and could not have been detached and projected into space, otherwise than by its disruption from such parent body.

Aerolites, meteorites and meteors bring with them nothing foreign; are therefore comparatively insignificant, and should not pass as evidence in the establishment of a philosophy. The tame uniformity of those bodies and the great inclination of their pathway, preclude them from being classed with external forces. Aerolites of immense size are not infrequently observed to pass almost horizontally, and in close proximity to the earth for hundreds of miles. These facts are destructive to the philosophy which the phenomena are claimed to sustain.

The periodical occurrence of meteors in August has been noted for centuries, and from this fact a hypothetical meteoric belt has been imagined. But this periodicity strongly points to their terrestrial character; and suggests that they are as purely meteorological as are the equinoctial storms.

KEPLER excluded fire-balls and shooting-stars from the domain of astronomy, because they are, according to his views, meteors arising from the exhalations of the earth. In other words, he supposed those phenomena to be due to electrical or magnetic causes. In fact, electricity can be condensed into balls of fire resembling meteors and shooting-stars, with their minute trains, by employing an air-pump, a glass tube and an electrical machine.

In view of all the facts which physical science presents, we are forced to the conclusion that there are no foreign bodies or substances existing in space; that none may be found within the range of our atmosphere, or which may come within its

range which are not of purely terrestrial origin.

SUN-SPOTS.

Sun-spots are now recognized as potential agencies in the solar economy. Certain well defined, extensive and often violent electrical manifestations are now traced to these phenomena. Winds, storms, auroral displays, vegetation and vital action are undoubtedly influenced by these perturbations. The present accredited philosophy of sun-spots is purely hypothetical and vague, and leads to numberless mechanical impossibilities. It demands that cavities capable of receiving a number of bodies as large as the earth be instantaneously formed in the sun, that solids, liquids and gasses perform miracles of motion; that changes occur at unimaginable rates of speed. Upon the electrical theory, on the other hand, we are assisted by all analogies found near at hand; and only generalize from known facts. From the terrestrial phenomena we know and explain the celestial. We infer that the varying intensity of solar action felt here is due to varying electrical or magnetic activity; that areas of lessened brightness, popularly called "spots" show local interruptions or interferences. ZOLLNER asserts that "the black umbra of a spot emits 4,000 times as much light as that derived from an equal area of the moon." Similar variations occur in terrestrial electricity.

That sun spots are due to electrical causes must necessarily be inferred from the manifestations. Spots of the largest dimensions come into the field of view almost instantaneously and as suddenly disappear. KRONE observed a large spot which sprang into existence in less than a minute of time. Dr. WOLLASTON once saw a spot which burst in pieces as he was looking at it. Sir WILLIAM HERSCHEL turned away his eyes from a group of spots he was observing, and when he looked again the group had vanished. Spots 50,000 miles in diameter are formed in a single day. What velocities must these sudden outbursts represent if they take place at the sun? It is not possible that such stupendous activities should result from the operation of any other force than the electric or magnetic.

The more permanent spots are undoubtedly due to local magnetic disturbances in the sun, by which its currents become arrested or diverted. The evanescent character of the spots just mentioned remove them from the domain of sun-phenomena otherwise than in appearance. It would be more rational to suppose them to originate in terrestrial sources of a local character, and to be due to interference with the great return-current.

Upon no other hypothesis than the electrical may all sun-spot phenomena be explained.

HENRY RAYMOND ROGERS, M. D.

Dunkirk, N. Y.

We have received a communication from Mr. Chas. L. Ball, of Little Missouri, D. T., entitled *On Sound*, in reply to the paper of Dr. Rogers which appeared in our October issue. Mr. Ball's views appear to coincide with the generally accepted undulatory theory illustrated in various text books. Want of space prevents our reproducing Mr. Ball's views.

We are glad to learn that Dr. H. R. ROGERS, who has contributed several valuable articles to our columns, has recently been elected a member of the New York Academy of Sciences. This election is an honor to the Academy as well as to Dr. ROGERS.

At the meeting of the Directors of the Western Union Telegraph Company held on the 13th inst., the resignation of Mr. George F. Baker, as a Director, was received and accepted, and Mr. J. Lowber Welsh, of Philadelphia, was appointed in his place.

EUROPEAN TELEGRAPH STATISTICS.

ACCORDING to statistics recently issued by the European International Bureau of Telegraphic Statistics at Berne, the total length of telegraph lines there at the present time is:—Russia, 50,090 miles; Germany, 44,265 miles; France, 43,650 miles; Austria-Hungary, 31,015 miles; Great Britain, 26,465 miles; Italy, 16,430 miles; Sweden and Norway, 12,625 miles; Switzerland, 4,097 miles; and Belgium, 3,505. The length of wires in the various countries is as follows:—Germany, 159,910 miles; Russia, 134,465 miles; France, 125,265 miles; Great Britain, 121,720 miles; Austria-Hungary, 89,960 miles; Italy, 53,692 miles; Sweden and Norway, 28,445 miles; Belgium, 16,345 miles, and Switzerland, 10,010 miles. The total number of messages sent during the past year are classed as follows:—England, 29,820,445; France, 19,882,628; Germany, 16,312,457; Austria-Hungary, 8,729,321; Russia, 7,298,422; Italy, 6,511,497; Holland, 3,109,230; and Sweden and Norway, 2,028,805.

SIXPENNY TELEGRAMS.

A letter appeared in *The London Times* over the signature "Telegram," in which the writer alludes to the statement recently made by Mr. Fawcett in the House of Commons, and criticises the refusal of the Government to allow the experiment of sending sixpenny telegrams for a certain period to be made. The writer says:—"Why the Government should have declined to make such an experiment when no loss could possibly accrue to the revenue is one of those matters which can only be understood by a permanent official. The refusal to test an experiment which could be conducted without cost seems to the ordinary mind to be the grandest proof of the bureaucratic obstruction to all improvement which is believed to prevail to a large extent in the Government offices. The question raised, however, by Mr. Stanhope leads to broader considerations than a mere experiment in telegraphic facilities. It can hardly be doubted but that if the telegraphic wires of the country were in the hands of private companies and were administered by private enterprise, instead of being a Government monopoly, the public would gain largely in rapidity, cheapness, and extension of telegraphic communication. It appears more than doubtful whether the monopoly given by Parliament and the purchase by the Government of the telegraph lines in the United Kingdom have not proved to be errors, and whether the time will not shortly arrive when the administration of telegraphy should be taken out of the hands of the Government and again intrusted to private enterprise."

BUSINESS NOTICES.

For the finest line of New Year cards, send ten cents early to
F. P. MUNN, CLYDE, N. Y.

If you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

DIVIDED No. 62.

THE WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, December 13, 1882.

THE Board of Directors have declared a quarterly dividend of one and one half per cent. upon the capital stock of this company, from the net earnings of the three months ending December 31st instant, payable at the office of the Treasurer on and after the 15th day of January next, to shareholders of record on the 20th of December instant.

The transfer books will be closed at 3 o'clock on the afternoon of December 20th instant, and opened on the morning of the 16th of January next.

R. H. ROCHESTER, Treasurer.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, December 20, 1882.

To all offices on Western Union lines:

The following changes, which have been made since November 20, 1882, should be entered in the Tariff Book, and the list of New Offices given in the JOURNAL of September 20, 1882, as they will not be republished.

Places in *italics* are to be found only in the list of new offices given in the Journal of September, 20, 1882.

CHANGES.

The following named offices in Michigan and Indiana will, until further notice, be treated as other line offices. Night and collect messages to them, cannot now be accepted. The "tariff for other lines" to these offices is 25 and 2 from Grand Rapids, or Kalamazoo, Mich., Richmond or Ft. Wayne, Ind.

MICHIGAN.

| | | | |
|-----------------|------------|-------|----------------|
| Ashton. | Leroy. | Oscel | Rockford. |
| Beitnars. | Co. | | Ross. |
| Belmont. | Lockwood. | | Sand Lake. |
| Boy & Falls. | Mancelona. | | South Boardman |
| Bradley. | Manton. | | Stanwood. |
| Cadillac. | Martin. | | Tustin. |
| Cedar Spgs. | Mendon. | | Walton. |
| Fife Lake. | Monteith. | | Wayland. |
| Harbor Spgs. | Morley. | | Alanson. |
| Kalkaska. | Paris. | | Elmira. |
| Kingsley, Grand | Petoakey. | | Levering. |
| Traverse Co. | Pierson. | | |

INDIANA.

| | | |
|----------------|-------------|---------------|
| Avilla. | Huntertown. | Swans. |
| Berna. | La Grange. | Wolcottville. |
| Fountain City. | Lima. | Briant. |
| Geneva. | Rome City. | |

No collect nor night messages will be taken for the above named places.

ARKANSAS.

- Ft. Smith now W. U. Office, square, 449.
- 381 Vandall should read 391 Vandale.

CALIFORNIA.

- 800 Avon, closed.
- Germantown now W. U. office, square, 799.
- 764 Lompoc, reopened.

COLORADO.

- Gothic, 60 4 (40 S. N. M.), Gunnison.
- Irwin, 25 4 (25 1 N. M.), Gunnison.
- 628 Lake City, now 681 Lake City.
- 628 Parline, reopened.
- 634 Silverton now 681 Silverton.
- 634 Rockwood now 681 Rockwood.
- Uncompahgre now 25 1 Montrose. Erase "25 2, Gunnison

- Ashcroft 75 5 (50 S. N. M.) Gunnison.
- Aspen, 85 6 (60 4 N. M.) Gunnison.
- 628 Kesar, closed.
- 599 Woodstock, closed.

CONNECTICUT.

- Watertown now 15 0 telephone, Waterbury.

DAKOTA.

- 914 Bristol, closed.
- 926 Ft. Thompson, closed.

FLORIDA.

Erase the foot note on page 34 of Tariff Book. The "other" line no longer charges for the "date and place of origin," in messages to "other" line offices beyond Pensacola. Night messages may now be accepted for the "other" line offices beyond Pensacola.

- Longwood now * Longwood, 150 9 Lake City.
- 315 Molino, reopened.
- Toca, closed.

GEORGIA.

- Whitesburg, closed.

ILLINOIS.

- 307 Lawndale, Cook Co., check Chicago.

W 299 Barton, 299 Breckon, 318 Hasell Dell, 309 Hunt Orig, 299 Sidell, 309 St. Maria, 309 West Liberty and 318 Westfield, closed.

IOWA.

- 338 Charlestown should read 338 Charleston.

KANSAS.

- 517 Ahem Creek changed to 517 Carmetro.

KENTUCKY.

- 254 Calvary, closed.

LOUISIANA.

Business for Farmersville, will hereafter be transferred at Monroe, La., instead of Trenton. No change in "other" line rate.

- Milkens Bend, closed

MAINE.

- Greenville is in Piscataquis Co.
- Woodfords Co new now * * Woodfords Corners, 35 0 Portland.

MASSACHUSETTS.

Cottage City, closed. Messages for places on the Island of Martha's Vineyard, (given under Martha's Vineyard in Tariff Book) will be delivered by express from Woods Holl, at a charge of 25 cents for each message.

- 21 East Saugus now * East Saugus, 25 0 telephone, Lynn.
- * Saugus Centre now 25 0 telephone, Lynn.
- 32 South Hadley Falls, Ok Holyoke.

MEXICO.

- Oahuahua, 94 8 El Paso or 400 40, Galveston, Tex.
- * Campeche, Pichucalco and Tuxtla, mail Vera Cruz, 25 cents postage.
- * Oculuama, mail Tampico, 25 cents postage.
- * Ures, mail Alamos, 25 cents postage.

MICHIGAN.

- Casinovia (re-opened) * Newaygo and * Sparta now 25 2, Grand Rapids or Holland.

MINNESOTA.

- 358 Reed's Landing should read 358 Read's Landing.

MISSISSIPPI.

- Ben Lomond, closed.
- Chotard, closed.
- Eggs Point, closed.

MISSOURI.

- 359 Summit Sta., P. O. Summitville. Erase "P. O. care Mineral Point."

MONTANA.

- 985 Ft. Keogh, closed.
- 958 Martin, closed.

NEW BRUNSWICK.

- 3 Carleton Sta., closed.
- 3 St. Louis, closed.

NEBRASKA.

- Endicott now W. Union office, square 513.
- 464 House, closed.

NEW HAMPSHIRE.

- * Bennington 15 0 Express, Greenfield or Hillsboro Bridge, or \$1 25 special delivery, Greenfield.
- * Hancock 15 0 Express Greenfield, or Hillsboro Bridge or \$1 25 special delivery, Greenfield.
- * Hancock June now W. Union office, square 28.
- 20 Livermore, closed.

NEW JERSEY.

- 47 Hartford, closed.

NEW MEXICO.

Messages addressed to Las Vegas Hot Springs, Hot Springs Las Vegas, or Montezuma Hotel, Las Vegas, should be checked with Hot Springs, N. Mex. and not with Las Vegas.

NEW YORK.

- 44 Au Sable Chasm, closed.
- 39 Ft. Ticonderoga, closed.
- 111 Four Mile, reopened.
- 39 Huletts Landing, closed.
- Montezuma now * * Montezuma 1.50 special delivery, or mail 9 A. M. daily, from Fort Byron.
- 44 Paul Smiths, closed.
- 44 Prospect House, closed.
- 39 Rogers Rock Hotel, closed.
- 44 Franklin Falls, closed.
- 44 Lake Placid, Stevens House, closed.
- 44 Millers Saranac Lake House, closed.
- 44 Tremblys Iron Works, closed.

NORTH CAROLINA.

- * Beaufort now * Beaufort 25 2 Newport. Erase "25 0 Morehead City."

NOVA SCOTIA.

- 2 Avondale, closed.

OHIO.

- 221 Beaver Dam, closed.

170 Bemont, under changes in last Journal, should read 170 Belmont, closed

202 Longstreth P. O., care Monday.

213 Duane Vista P. O., care Freestone.

ONTARIO.

- Buxton, reopened.
- Castleton, closed.
- Clifton House, closed.
- Eden Mills, closed.
- Harwood, "
- St. Davids, "
- Thomasburg, closed.
- Wilkesport reopened.
- Stamford, closed.
- Stromness, closed.

OREGON.

- 785 Rooster Rock, closed.
- 803 Hillsboro, closed.
- 889 Redfield's, closed.

PENNSYLVANIA.

- 111 Babcock's Mills, reopened.
- 59 Darby, closed.
- 130 Enterprise, Warren Co., closed.
- 111 Seahonda P. O., Deguscahonda

QUEBEC.

- Hadlow Cove, closed.
- Filles Branch, "
- Point Haton, "
- River des Prairies, closed.
- Riviere du Loup Wharf, closed.
- St. Leon Spgs, "
- St. Alphonse de la Grande Baie, closed.

TEXAS.

- 654 Grleton changed to 654 Marlenfield.
- * Mason, re-opened 25 1 Baird or San Antonio. Erase the Denison route.
- * D'hams now 65 5 San Antonio.
- * Honda City now 65 5 San Antonio.

VERMONT.

- * Harwellsville 15 1 telephone, No. Adams, Mass.
- * Jacksonville 20 1 " " "
- * Readsboro 15 1 " " "
- * Readsboro Falls 15 1 " " "
- * Sadawaga 20 1 " " "
- * Stamford 10 1 " " "

VIRGINIA.

- * Newport News now 25 2 Hampton or 30 2 Richmond.
- * Williamsburg now 25 2 Richmond.
- 86 E. F. and P. Junction should read 86 Richmond, Fredericksburg and Potomac Junc.

CENTRAL AND SOUTH AMERICAN CABLES.

Messages to Monte Video may now be accepted for transmission via Galveston, Texas; tariff, \$1 25 per word more than the rate via Galveston to Valparaiso.

CUBA CABLE.

The cable between the Island of Jamaica and the Isthmus of Panama has been repaired, and the rates to Aspinwall (Colon) and Panama on messages via that route will hereafter be as follows:

- From all Western Union offices in the United States;
- To Aspinwall (Colon), \$1.42 per word,
- To Panama, \$1.37 per word.

From Western Union offices in Nova Scotia and New Brunswick:

- To Aspinwall (Colon), \$1.45 per word.
- To Panama, \$1.40 per word.

The rates on page 350 of the Tariff Book should be changed to agree with the foregoing.

The rates "Via Galveston, Texas," to Aspinwall and Panama, which were given in the Journal of August 20, 1882, and which, except for Texas and Louisiana, are the same as those given above, are still in force for messages via that route.

ATLANTIC CABLE.

The best means of communicating by telegraph with Muscat in Arabia, is by post from Gwadar in Beloochistan. Tariff from London, \$1.60 per word. The words "post Gwadar" must be inserted after the address, and charged for.

NEW OFFICES.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book and in the

JOURNAL of Sept. 20, 1882, as well as to those named below.

ALABAMA.

244 Dudley. 266 Greenwood. 275 Limrock.
 • Prattville, 30 3 (25 2 N. M.) Montgomery.
 • • Menlo, mail Limrock.

ARIZONA.

661 Ash Fork. 661 Chino. 641 Nogales.
 641 Calabassas.

• Total Wreck, 25 2 Pantano.

ARKANSAS.

412 Appleton. 401 Judeonia. 381 Olyphant.
 441 Biene. 392 Hazen. 449 Porter.
 371 Delaplaine. 441 Homan. 449 Rudy.
 401 Garner. 412 Mcmont. 449 Van Buren.
 381 Goodwin. 449 Mountainburg.
 • Altus, 40 3 Little Rock.
 • Hensley, 50 4 Pine Bluff.
 • Dermott, 50 4 Pine Bluff.
 • Redfield, 50 4 Pine Bluff.
 • Wrightsville, 50 4 Pine Bluff.
 • Woodson, 50 4 Pine Bluff.

CALIFORNIA.

668 Calico Sta. 668 San Pablo Station. 736 Yuca Sta.
 789 Corning.
 • • Calico, by stage, Calico Sta.
 • Ft. Bidwell, 50 3 Ashland, Oregon.

COLORADO.

628 Cerro. 598 London Juno. 628 Montrose.
 679 Delta.
 • • Chihuahua, mail, Dillon.
 • • Decatur, mail, Dillon.
 • • Easton (N.M.), 40 3 Denver.
 • • Fremont Butte, 70 5 Plattsmouth, Neb.
 • • Montezuma mail, Dillon.
 • • Schofield, 75 5 (50 3 N. M.) Gunnison

CONNECTICUT.

29 E. Berlin.
 • • Westport, 10 0 Bangatuck

DAKOTA.

864 Ardock. 930 Highmore. 890 Portland.
 926 Bramhall. 895 Larimore. 895 Reynolds.
 897 Castlewood. 916 Letcher. 890 Ripon.
 915 Columbia. 854 Marvel. 921 White Swan.
 915 Doland. 889 Minto. 920 Rudolph.
 926 Frankfort. 895 Ojata. 696 Walcott.
 889 Grafton.
 • • Galena, 25 2 telephone, Deadwood.

FLORIDA.

219 Jasper
 • • Mason, (N.M.) 100 6 Lake City.
 • • Limousia, 125 8 Lake City.
 • • Sumterville, 75 5 Lake City.

GEORGIA.

206 Crawford. 266 Hermitage. 227 Marshallville.
 246 Decatur. 217 James Sta.
 • Chipley, 30 3 Columbus.
 • Dallas, 40 2 Atlanta.
 • • Ga. Pacific Juno, 25 2 Atlanta.
 • • Hamilton, 25 2 Columbus.
 • • Indian Springs, 40 3 Atlanta.
 • • James Ferry, 40 3 Atlanta.
 • • Lexington, 50 0 Crawford.
 • • Locust Grove, 30 3 Atlanta.
 • • McDonough, 25 2 Atlanta.
 • • Powder Springs, 25 2 Atlanta.
 • • Rockmart, 40 3 Atlanta.
 • • Stockbridge, 25 2 Atlanta.
 • • Tryon Factory, 30 2 Rome.

IDAHO.

579 American Falls. 578 Montpelier. 578 McCommen.

ILLINOIS.

316 Argyle. 346 Mason. 317 Union Hill.
 358 Chesterfield. 317 Tracy. 319 Wayne City.
 347 Marietta.

INDIANA.

242 Bloomingsport. 300 Goldthwaite. 272 Stinesville.
 290 Buell City. 292 Leonard. 289 Wingate.
 252 De Soto. 290 Linton. 241 Summit, De Kalk Co.

INDIAN TERRITORY.

477 Tulsa.

IOWA.

435 Churdon. 463 Haward-n. 444 Okoboji.
 435 Lane. 463 Howell. 463 Orange City.
 435 Irtson. 463 Irtson. 417 Plano.
 425 Gilmore. 425 Kelley. 425 Rolfe.
 463 Granville. 876 Lake Park. 425 Rockwell City.
 417 Harvard. 367 Lowden. 425 Rodman.
 463 Maurice. 463 Sheridan.
 • Allison. 25 2 Waverly.
 • Aspinwall. 40 3 Marion, or 25 2 Council Bluffs.
 • Astor. 40 3 " " 25 2 "
 • Atkins. 25 2 " " 40 3 "
 • Bagley. 40 3 " " 30 2 "
 • Bayard. 40 3 " " 25 2 "
 • Bristow. 25 2 Waverly.
 • Cambridge. 30 2 Marion, or 40 3 Council Bluffs.
 • Collins. 25 2 " " 40 3 "
 • Coon Rapids. 40 3 " " 25 2 "
 • Covington. 25 2 " " 40 3 "
 • Dedham. 40 3 " " 25 2 "
 • Defiance. 40 3 " " 25 2 "
 • Dumont. 25 2 Waverly.
 • Dunbar. 25 2 Marion, or 40 3 Council Bluffs.
 • Elbaron. 25 2 " " 40 3 "

• Ekadot. 15 1 telephone, McGregor.
 • Ferguson. 25 2 Marion, or 40 3 Council Bluffs.
 • Gladstone. 25 2 " " 40 3 "
 • Hansell. 25 2 Waverly.
 • Haverhill. 25 2 Marion or 40 3 Council Bluffs.
 • Huxley. 30 2 " " 40 3 "
 • Jamaica. 25 2 " " 30 2 "
 • Keystone. 25 2 " " 40 3 "
 • Louisa. 25 2 " " 40 3 "
 • Madrid. 30 2 " " 40 3 "
 • Marthan. 40 3 " " 25 2 "
 • Maxwell. 25 2 " " 40 3 "
 • Melbourne. 25 2 " " 40 3 "
 • Newhall. 25 2 " " 40 3 "
 • Panama. 40 3 " " 25 2 "
 • Persia. 40 3 " " 25 2 "
 • Potter. 25 2 " " 40 3 "
 • Portsmouth. 40 3 " " 25 2 "
 • Rhodes. 25 2 " " 40 3 "
 • Sumner. 25 2 Waverly.
 • Tripoli. 25 2 "
 • Templeton. 40 3 Marion, or 25 2 Council Bluffs.
 • Underwood. 40 3 " " 25 2 "
 • Van Horne. 25 2 " " 40 3 "
 • Vining. 25 2 " " 40 3 "
 • Woodward. 30 2 " " 40 3 "
 • Warrack. 40 3 " " 25 2 "
 • Yorkshire. 40 3 " " 25 2 "

KANSAS.

612 Argonia. 517 Carcetro. 507 Green.
 514 Asaria. 514 Cedar Grove. 457 Memphis.
 475 Bellvue. 455 Connors. 465 Padonia.
 507 Camden. 456 Easton. 465 Reserve.
 558 Eggleston. 465 Robinson.

• Ft. Dodge, 25 1 Dodge City, Ks. or Baird, Texas.
 • Pomona, 25 2 telephone, Ottawa.

KENTUCKY.

263 Asylum Depot. 234 London. 263 St. Matthews.
 243 Boyd. 310 Providence. 254 St. Marys.
 234 East Bernstadt. 254 Rieys. 234 Pittman.
 • Escalopia Springs 10 1 telephone, Vanceburg.
 • Aden. 25 2 Huntington, W Va., or 35 2 Lexington, Ky.
 • Denton. 25 2 " " or 35 2 "
 • Farmer. 25 2 " " or 30 2 "
 • Meade. 25 2 " " or 35 2 "

LOUISIANA.

424 Bunkie. 424 Morrow. 464 Ravenwood.
 375 Davis. 464 Negrofoot. 375 St. John.
 408 Gordon.
 • Atherton 50 4 Tallulah.
 • Long Springs 10 1 Minden.
 • Newton 25 2 (25 1 N.M.) Natchez, Miss.
 • Waterproof 25 2, (25 1 N.M.) Natchez, Miss.

MAINE.

29 West Bethel.
 • Green's Landing, Deer Isle, 25 2 Ellsworth.
 • Greenville, 25 2 telephone, Farmington.
 • Madrid 20 2 telephone, Farmington.
 • Bangsley 25 2 telephone, Farmington.

MANITOBA.

Belgonie. Indian Head. Stony Mountain.
 Burrows. Marquette. Varden.
 Capelle. Morris. Wapella.
 Canella. Moonson. Whitewood.
 Elkhorn. Poplar Point. Wolfe Creek.
 Fleming. Red Jacket. Wolseley.
 Grenfell. Regina.
 • Rat Portage, (see Ontario.)

MASSACHUSETTS.

25 East Medway. 21 So. Sudbury. 21 West Medford
 • Acushnet 10 0 telephone, New Bedford.
 • No. Middleboro, 15 telephone, Bridgewater.
 • Onset Bay 15 0 telephone, New Bedford.
 • Rochester 15 0 telephone, New Bedford.

MEXICO.

• Imuris. 40 3 Nogales, Arizona.
 • Idano. 40 3 " " "
 • Magdalena. 40 3 " " "
 • Santa Ana. 40 3 " " "
 • Pezquerra. 60 4 " " "
 • Orta. 70 4 " " "
 • Torres. 70 4 " " "
 Bustamante 37 3 Laredo, Texas.
 Guadalupe (Zacatecas), 450 43 Galveston Tex.
 Jalpa 400 43 Galveston, Tex.
 The tariff for "other" lines from Galveston, Texas to the following is 400—40:
 Aramberri.
 Aris.
 Ayotla.
 Buena Vista (Distrito Federal).
 Buena Vista (Conora).
 Doncominguito.
 Fuerte.
 Galeana.
 Guadalupe de los Reyes.
 Huasteco.
 Jimenez.
 Juchitán.
 Lerdo Villa.
 Matatepec.
 Miahualan.
 Padilla.
 Patos.
 Paso del Tusaio.
 Parras.
 Peotillos.
 San Pedro del la Colonia.
 San Fernando de Procesa.
 San Felipe del Obraje del Progreso.
 San Juan de las Llanas.
 San Marcos de Colonia.
 Taretan.
 Tacambaro.
 Tlatlanquitepec.

Urnapam.
 Villa Garcia.
 Villa del Reyes.
 Villa Juarez.
 Valle de San Francisco.
 Zaragoza.
 Zacapoaxtla.

MICHIGAN.

119 Bear Lake. 251 Nottawa. 250 Six Lakes.
 269 Big Rapids June 177 Pellaville. 230 South Bay City.
 Ok. Muskegon. 231 Scipio. 119 Sweetland.
 127 Elmira. 836 Stambaugh. 269 W. Troy, Ok.
 260 Dutton. White Cloud.
 127 Leveing.
 • Bailey, 25 2 Grand Rapids or Holland.
 • Dollarville, 40 3 Marquette.
 • Grant, 25 2 Grand Rapids or Holland.
 • Hendria. 40 3 Marquette.
 • Kent City, 25 2 Grand Rapids or Holland.
 • Kirks Jun., 25 2 " "
 • Mona Lake, 25 2 " "
 • West Olive, 25 2 " "

MINNESOTA.

584 Beltrami. 865 Gibbon. 875 Morton.
 591 Bear-aley. 865 Franklin. 880 Nelson.
 865 Clearwater. 861 Minneapolis Jun. 865 Osseo.
 861 College Place. 865 Monticello. 887 Rushmore.
 868 Eggleston. 891 Norcross. 880 Villard.
 864 Fairfax.

MISSISSIPPI.

363 Hardy.
 • Lagomar, 50 3 Vicksburg.

MISSOURI.

429 Galloway. 428 Hughesville. 448 Kenoma.
 410 Mansfield. 468 Millard. 429 Osark.
 427 Wellington.

• Ashland, 25 2 Columbia.
 • Cairo, 10 1 telephone, M. Berly.
 • Lamar 10 1 telephone, Lamar Sta.
 • Marble Hill, 10 0 telephone, Lutesville.
 • North Greenfield. 25 2 South Greenfield.
 • Rockport, 25 2 Phelps.
 • Sumner, 25 2 Unionville.

MONTANA.

966 Allard. 962 Livingston. 962 Springdale.
 971 Beltnap. 961 Merrill. 971 Thompson River.
 960 Huntley. 961 Park City. 978 Trout Creek.

NEBRASKA.

474 Auburn. 922 Ewing.
 474 Berlin. 474 Hickman. 519 North Loup.
 473 Craig. 506 Hoskins. 927 Thacher.
 • Sharon, 35 2 Plattsmouth.

NEW BRUNSWICK.

8 Kent Junction. 8 Rogersville.
 • Seal Cove, Grand Manan, 25 2 Fastport, Ma.

NEW HAMPSHIRE.

17 Rye Beach Cable Sta.

NEW JERSEY.

52 Bernardsville. East Orange. 52 Stillwater.
 52 Columbia, War- 52 Marksboro. 41 Two Bridges.
 ren Co. 41 New Milford. 52 Washingtonville.
 41 Grovestand, Ok. 52 Sparta Depo.
 • Atlanticville, 25 0 Long Branch.
 • Branchburg, 10 0 Long Branch.
 • Branchport, 30 0 Long Branch.
 • Mormonth Park, 50 0 Eatontown.
 • No. Long Branch, 25 0 Long Branch.
 • Oceanport, 50 0 Eatontown.
 • Oceanville, 150 0 Long Branch.
 • Pleasant Bay, 30 0 Long Branch.
 • West End, Long Branch, 25 0 Long Branch.

NEW MEXICO.

639 Carthage. 566 Los Carrillos.

NEW YORK.

120 Ashford. 120 Java Centre. 101 Ohi.
 120 Cur iers. 120 Johnsonsburg. 101 Peckinville.
 110 E. Bethany. 101 Leicester. 101 Silver Lake Junc.
 101 Groveland, P. O. 46 Mongaup. 120 Varysburg.
 No sparta. 120 No Java. 110 York.
 • Allens Hill, 20 0 telephone, Canandaigua.
 • Bristol, Baptist Hill, 15 0 telephone, Canandaigua.
 • Brookfield, 15 1 North Brookfield.
 • Dolgeville, 20 0 telephone, Little Falls.
 • Greenwood, Steuben Co., 10 1 telephone, Canisteo.
 • Honesoye 2, 0 telephone, Canandaigua.
 • Inghams Mills, 20 0 telephone, Little Falls.
 • Jasper, 10 1 telephone, Addison.
 • Monterey 10 1 telephone, Beaver Dams.
 • Port Dickinson, 10 1 telephone, Binghampton.
 • Rexville 15 1 telephone, Canisteo.
 • Salisbury Centre, 20 0 telephone, Little Falls.
 • Salisbury Corners, 20 0 telephone, Little Falls.
 • T. Coopersburg, telephone 10 1 Addison.
 • Woodhul, 10 1 telephone, Addison.

NORTH CAROLINA.

116 Chadbourne. 70 Newport. 184 Old Fort.
 105 Middleburg.

• Old Sparta, 25 2 Tarboro.

NOVA SCOTIA.

• Ohio, 15 1 telephone, Yarmouth.

OHIO.

211 Curtice. 232 Lafayette. 170 Sandyville.
 242 Centerville. 222 Lebanon Junc. 170 Sparta.
 242 Douds. 231 Limestone. 211 Trowbridge.
 180 Earlville. 232 Lorainie. 159 Washingtonville.
 232 Fletcher. 241 Lytle. 232 Yorkshire.
 242 Florence. 170 No. Industry. 211 Williston.
 211 Kingsway. 213 Peebles.
 • Berlin Centre, 25 2 Alliance.
 • Cincinnati Race Course, 25 2 Cincinnati.

* E. Ashtabula, 15 1 No. Kingsville.
 * New Lexington, Highland Co., 35 3 Cincinnati or Chillicothe.
 * No. Jackson, 25 2 Alliance.
 * Plymouth, Ashtabula Co., 25 2 No. Kingsville.

ONTARIO,
 Ballantrae Sta. Luther Sta. No. Buxton.
 Falkirk. Moscow Tecumseh.
 Keene Sta. New Germany. Walsh.

813 Latham. 805 Riddles, ck. 785 Wyoth.
 785 Troutdale. Myrtle Ok.
 * Lakeview, 50 3 Ashland.
 * Linkville, 50 3 Ashland.

PENNSYLVANIA.
 130 Anchor. 140 Grove City. 75 Bummerfield.
 130 Byrums. 52 Gravel Place. Ok. Towanda
 161 Coal Center. Ok. 102 Hyner. 130 Sheffield Junc.
 California. 102 Keating. 151 Summit.
 159 East New Castle. Clinton Co. Allegheny Co.
 140 Evansboro, But-151 McKeans Farm. 151 Tomer.
 ler Co. 151 Pine Creek. 130 Vandergrift.
 111 Rofe. 140 Wick.

* Lisenring, 25 2 Connellsville.
 * Sugar Grove, 25 1 Jamestown, N. Y.
 * Taylorsville, Bucks Co., free, Washington Crossing, N. J.

QUEBEC.
 Boulogne. Ohateaugay. St. Alexis Grand Baie
 Bersimis. Dundee. Windsor Powder
 Breckenridge. Port neuf-naut Mills.
 Cape Madeleine. St. Felix de Valois.
 Light House. Sault au Cochon.

RHODE ISLAND.
 * Kingston Hill 20 2 telephone, Providence.

SOUTH CAROLINA.
 136 Santee River. 156 McNiels.
 * Barnwell, 25 2 Blackville.

TENNESSEE.
 281 Belle Buckle 194 Limestone

TEXAS.
 470 Avenger. 748 Keller. 654 Marienfeld (So).
 490 Bartlett. 491 Louisa. 655 Monahan (South).
 491 Edna. 663 Miller. 673 Murphysville (So)
 494 Hutto. 500 McGregor. 451 Scottsville.
 490 Granger.

* Belleview (N. M.), 30 3 Fort Worth.
 * Bertram, 40 3 Austin.
 * Cleveland, 35 3 Houston.
 * Livingston, 50 3 "
 * Shepherd, 50 3 "
 * Wichita Falls, (N. M.) 40 3 Ft. Worth.

UTAH.
 In addition to the W. Union rate to these
 576 Lehi June. } offices an additional charge of 30 and 2
 576 Ironton. } should be made to cover the tolls of a cor-
 576 Tintic. } recting line over which messages to these
 offices must pass.

VERMONT.
 36 South Shaftsbury. 31 Tunbridge.
 * Randolph Centre, 10 1 telephone, West Randolph.

VIRGINIA.
 118 Bentonville. 123 Elkton. 123 Stuarts Draft.
 * Ft. Lee, 25 2 Richmond.
 * Lee Hall, 25 2 "
 * Morrisous, 30 2 Richmond.
 * Providence Forge, 25 2 Richmond.
 * Pedlars 40 3 Richmond.
 * Roxbury, 25 2 "
 * Tano, 25 2 "
 * Yorktown, 30 2 Richmond.

WASHINGTON TERRITORY.
 722 Alto. 723 Palouse Junc. 794 Winlock.
 794 Ochalas. White River.
 * Irondale 75 5 Seattle.

WISCONSIN.
 856 Cameron. 835 Fuller. 841 Phinelanders.
 855 Cartwright. 852 Gordon. 855 Rice Lake.
 852 Chicago Junc. 855 Middle River. 849 Whittlesey.
 335 Footville. 841 Montello.

* Delafeld 10 1 telephone, Nashotah.
 * Duck Creek, 15 0 telephone, Green Bay.
 * Ellitville, 20 0 telephone, "
 * New Franklin, 15 0 telephone, "
 * Ironton, 10 1 telephone, Lavallo.
 * Rochester, 10 1 telephone, Burlington.
 * Spring Prairie, 10 1 telephone, Springfield.
 * Waterford, 10 1 telephone, Burlington.

WYOMING.
 548 Archer. 573 Waterfall.
 * Hartville 15 1 telephone, Fort Laramie.
 * White River, 25 1 Rawlins.

NORVIN GREEN, President.

PROPOSALS FOR INK.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock noon, Wednesday, Jan. 10, 1883, for furnishing 6 months supply of Ink.

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

100 Gallons Machine Copying Ink, in bulk. Samples required, delivery as required.

20 Gro. Combined W. and Copying Fluid, quarts. Sample required. Delivered as required, in lots of one gross.

20 Gro. Combined W. and Copying Fluid, pints. Delivered in lots of one gross, or more, as required.

5 Gro. Combined W. and Copying Fluid, half-pints. Delivered as required, in lots of one gross, or more.

It is understood that the contract made in accordance with these proposals shall be valid and binding from the first day of February, 1883, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company require the goods contracted for.

Bills to be paid between the 15th and 25th of each month following the deliveries.

The right is reserved to reject any or all bids, or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Each bid must include delivery at our Supply Department, New York or Chicago, and no charge to be made for freight, cartage or package.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR INK."

WM. HUNTER,

Supt. Supplies.

New York, December 26th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR MISCELLANEOUS PAPER.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Wednesday, Jan. 10th, 1883, for furnishing 6 months' supply of the following named articles:

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

4,900 REAMS MANILLA COPYING PAPER, 21x32 inches, 15 pounds to 500 sheets, unsized, and equal in all respects to sample furnished. Sample required. Name price per pound for cutting up in sheets 5 1/2 x 8 inches. Put up in packages of 1,000 sheets, with strong manilla wrappers. Delivered at Supply Department, New York, in lots of 100 reams, or more, as may be required. The contractor must keep on hand at all times ready for delivery, not less than 600 reams.

54,000 pounds WHITE MESSAGE PAPER, cut 5 1/2 x 8 inches, and 8 1/2 x 10 1/2 inches. Samples furnished and required, and paper delivered on account of contract to be in all respects equal to such samples. Put up in packages of 1000 sheets, with strong manilla wrappers. Delivered at Supply Department, Chicago, in lots of 1,000 to 1,500 lbs.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the first day of February, 1883, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company may require the goods contracted for.

Bills to be paid between the 15th and 25th of the month following the deliveries.

The right is reserved to reject any and all bids, or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Each bid must include delivery at our Supply Department, New York or Chicago, without charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed.

"PROPOSALS FOR MISCELLANEOUS PAPER."

WM. HUNTER,

Supt. Supplies.

New York, December 18th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR MISCELLANEOUS ARTICLES.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Monday, Jan. 8th, 1883, for furnishing 6 months' supply of the following named articles:

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

3 1/2 Gross Battery Brushes. To be like samples.
 4 Dozer Marine Clocks, 8 in.
 25 Gross Porcelain Knobs.
 250 Rolls Kerite Tape.
 500 Rolls Elastic Tape.

10 Gross "Horseshoe" Paper Clips.
 10 Gross Bell Top Mucilage Bottles with brushes.
 100 Boxes Nos. 2 and 3 Paper Fasteners, Magill's Round Head.

Samples can be seen at the office of the Superintendent of Supplies, and articles furnished on contract must be fully equal to sample. All deliveries subject to inspection and acceptance or rejection.

Bidders will please submit with bid a sample of article or articles proposed to be furnished, plainly marked with bidder's name and date of proposal.

Bidders will please name the price of each article separately.

Deliveries to be made as required; and bills to be paid between the 15th and 25th of each month following the deliveries.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the 1st day of February, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company may require any part of the goods contracted for.

The right is reserved to reject any and all bids, or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Each bid must include delivery at our Supply Department New York or Chicago, free of charge for freight, package or cartage.

Bidders will please observe all the terms of these specifications and make their proposals strictly in accordance with the same.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR MISCELLANEOUS ARTICLES."

WM. HUNTER,

Supt. Supplies.

New York, Dec. 18th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR BATTERY JARS AND CARBONS.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Monday, Jan'y 8th, 1883, for furnishing 6 months' supply of the following named articles:

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

2000 Doz. Battery Jars, 6x8, best quality, flint glass bottoms punted, to be carefully packed and delivered as required.

300 Dozen Battery Jars 4 1/2 x 4 1/2 inside measurement—best quality flint glass, bottoms punted, to be carefully packed and delivered as required.

3,700 Carbons, No. 2, 6x7 1/2 inches. Sample furnished and required. Delivered in lots of 500.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the first day of February, 1883, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company may require the goods contracted for.

Bills to be paid between the 15th and 25th of each month following the deliveries.

The right is reserved to reject any and all bids, or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond, with two (2) sureties, for the proper fulfillment of the contract.

Each bid must include delivery at the Supply Department, New York or Chicago, free of charge for freight, package and cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR BATTERY JARS AND CARBONS."

WM. HUNTER,

Supt. Supplies.

New York, Dec. 20th, 1882.

A copy of these specifications must accompany each bid.

PROPOSALS FOR STATIONERY.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Monday, Jan'y 8th, 1883, for furnishing 6 months' supply of the following named articles:

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

6000 Gross plain Cedar Lead Pencils; samples required. Delivered in lots, 100 gross each.

3,000 Gross Falcon Pens, "Newmans," or equally good; sample to be furnished. Delivered in lots, 100 gross each.

75 lbs. "Express," Sealing Wax, 4 sticks to the pound; sample required. Delivered as required.

20 Dozen Letter Books, 9x11 500 pp., index to be inter-leaved; sample required. Delivered as required.

5 Gross Silliman's School Inkstands, or equally suitable, Nos. 1 and 2. Delivered in lots of 6 dozen.

600 lbs. Medium Twine, 18 and 36 B. No. 6 Hemp, best quality, sample required. Delivered as required.

300 Gross plain Cedar penholders; Sample required. Delivered in lots of 100 Gross or more.

10 Dozen Rogers', or equally good, steel erasers, wood handles. Delivered in lots of one dozen.

50 Gr. Gross Rubber Bands each, Nos. 30 and 50; sample required. Delivered as required.

25 Gr. Gross Rubber Bands, 0 1/2 inch; sample required. Delivered as required.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the 15th day of February 1883, for 6 months, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company may require the goods contracted for.

Bills to be paid between the 15th and 25th of the month following the deliveries.

The right is reserved to reject any and all bids or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Each bid must include delivery at our Supply Department, New York or Chicago, without charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR STATIONERY."

WM. HUNTER,

Supt. Supplies.

New York, December 18 h, 1882.

A copy of these specifications must accompany each bid.

THE OPERATOR

Enlarged to the Size of The "Scientific American,"
And Published Every Saturday.

THE OPERATOR FOR 1883.

THE OPERATOR, which with the issue for January 6, 1883, enters upon its fourteenth volume, is now published Weekly, and is the only electrical journal on the American Continent that is issued so frequently. It is, therefore, the only one that can keep its readers thoroughly and promptly informed of everything of interest to them transpiring at home and abroad. It is absolutely independent of all official influences as well as of factions and cliques of all kinds.

In addition to Telegraphy proper, The Operator also gives prominent attention to

TELEPHONY AND ELECTRIC LIGHTING,

having a separate department for each of these important Outgrowths of the Telegraph. It is a

STALWART, UNCOMPROMISING JOURNAL,

and its chief aims are to elevate the profession, to popularize electrical science and to cement the fraternity in one compact body, thus rendering it proof against assault from all quarters. It is

CAREFULLY AND CONSCIENTIOUSLY EDITED.

We regard it as our peculiar province to find out stany cost what is going on electrically, to make it public in a truthful and lucid manner. THE OPERATOR maintains

INTELLIGENT AND ABLE CORRESPONDENTS

at all important telegraph, telephone and electric-light centres, on the frontier, in Europe, and the Pacific Archipelago.

AS A SCIENTIFIC JOURNAL,

THE OPERATOR is unsurpassed, and keeps its readers well up to the ever widening and deepening subject of electrical science. The most advanced electrician will be continually finding something new to learn in its columns. The student of electricity in all its branches will find the subject dealt with with all the clearness and simplicity of a Primer. Our articles bearing upon the fundamental principles of electrical science are written so as to disentangle the multiplicity of knotty questions and to present them

STRAIGHT AND SMOOTH TO OUR READERS,

thus affording the junior members of our profession an opportunity of mastering, in an easy way, the most intricate questions. It places before you every week a large number of

REVIEWS AND ESSAYS

of great interest and intrinsic value. And, moreover, it is well known to be

First, Last and All the Time for Operators and Electrical Workers and Their Best Interests.

What an able authority says of The Operator

Mr. JOSEPH CHRISTIE, whose long experience in Telegraphy and the Associated Press, as well as Telegraphic and general Journalism, gives his opinion additional weight, speaking of THE OPERATOR, says:

"THE OPERATOR has made an heroic fight for the Operator, but it seems to me that much of its success has been due to the fact that its scientific articles have always been written with a simplicity which has commended itself to the least informed upon electrical subjects: while the vigor of its arguments has commanded the attention and respect of every one."

"From its first issue, as a small four-page local paper, in 1874, to the present valuable and instructive form—keeping pace with the grand inventions of the quadruplex and the telephone, and the great improvements in the electric light—I have looked principally to THE OPERATOR for my information; and, to me, it has been the power-share that turned up buried facts, and the pole-star which pointed out the telegrapher's true path."

WHAT OTHERS SAY.

"If every telegraphist in the land would read THE OPERATOR, we could in a very short time note the result in the bettering of our condition. E. N. R., Otto, Ill.

"It is the only Operators' paper published."

"A," Albany, N. Y.

In Issuing the Paper Weekly,

we felt that we could confidently rely upon receiving the continued support of the telegraph, telephone and electrical workers of America, who have never yet failed to respond to our efforts in their behalf. We believed that they were alive to their interests, and to the importance of keeping step with the progress of electrical research. The result has shown that we were not mistaken. The weekly has been hailed with the most gratifying enthusiasm by telegraph, telephone and electrical men of every rank and position throughout the United States and Canada, as well as abroad. The circulation is larger to-day than it has been at any time since the paper was established, and the increase during the present winter promises to be much greater than during any previous one.

ENLARGING THE SIZE.

Not only has THE OPERATOR, true to its record of keeping well up with the times, been compelled to increase its frequency of issue, but commencing with the first number in 1883, it will be permanently enlarged to the

Size of The Scientific American,

and will contain every week the same number of pages as does that journal.

This fidelity, we are sure, will be fully appreciated by those who have watched and admired the progress of THE OPERATOR in the past. We need scarcely add that in the enlarged and more frequently issued OPERATOR the same old standard that has characterized it heretofore will not only be maintained, but we shall ever be on the alert to introduce further improvements and to render the paper so interesting, instructive and valuable, as to be absolutely indispensable to all interested in telegraphy, telephony, electric lighting and electricity in general.

WHY EVERYBODY SHOULD READ THE OPERATOR.

A profession like ours, growing daily, hourly, and with its various branches in the telephone companies, the electric light interests, the railroads and Signal Service, the working members of all of which are unsurpassed in activity, ingenuity and the importance and effectiveness of their work, should support a first-class, thorough-going, independent paper, to be spread broadcast over the civilized world.

Subscription, including Postage,

Invariably in advance,

ONE COPY, One Year, \$2.00.

Six Months, \$1.00; Three Months, 50c.

CLUB RATES:

Five or more Yearly Subscriptions, \$1.50 each.

With a copy for One Year FREE to the getter up of a club of TEN yearly subscriptions.

Liberal Premiums in books, etc., or cash commissions if preferred, for large clubs. Sample copies and particulars on application.

OUR NEW CLUB RATES.

SPECIAL TERMS TO EVERYBODY.

Any person desiring to subscribe for THE OPERATOR will remember three things:

First.—That in no case can the paper be had on a single subscription for less than \$2.00 per annum.

Second.—That five or more persons, whether new subscribers or renewals, may club together and get the paper for the low price of \$1.50 a year each, postage prepaid.

Third.—That to any person sending in a club of ten yearly subscriptions, at this low price of \$1.50 each, we will mail a copy of the paper for one year free and postage prepaid.

Copies ordered in a club will be sent to the same or separate address, as desired, and addresses will be changed as often as requested without extra charge.

Many thousands are taking advantage of these low terms, and we earnestly ask every one who may see this advertisement to make the experiment now of asking his friends to join him in subscribing for the coming year. Let some one in every office draw up a subscription, put his name to it, and then say to his friends in the same town and over the wires: "Join me in taking the weekly OPERATOR, postage prepaid, for one year, at \$1.50." We believe that from 5 to 100 subscribers could easily be obtained along every railway line in the country on these low club terms. An hour's work would start the ball.

This low rate is made so that operators on railway lines and others of small salaries may not be denied the weekly visits of THE OPERATOR. It is almost superfluous to add that \$1.50 for 52 copies does not pay the bare cost of producing the paper. You know the many advantages to the fraternity that would accrue if everyone connected with the business read THE OPERATOR regularly. Will you not, then, lend a hand toward this result by getting up a club?

The copies ordered in a club will be mailed to the same or separate addresses, as desired. In getting up a club, send the names and money (at the \$1.50 rate) as you receive them. These can be added to at any time. When the club is complete, your free copy or other premium will be forwarded you. Sample copies of the paper for use in getting up club will be mailed free on application; or send names and addresses and we will forward specimen copies to each direct from this office.

Postage to any part of the United States or Canada is always prepaid by the publisher, and addresses are changed as often as desired, without extra expense.

Remit by P. O. Order, draft, registered letter or express. U. S. postage stamps taken. Address communications and make orders payable to

W. J. JOHNSON, Publisher,
No. 9 MURRAY STREET, NEW YORK.

PROPOSALS FOR MANIFOLD AND CARBON PAPER.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Wednesday, Jan'y 10th, 1883, for furnishing six months' supply of the following named articles:

(The quantities named are only estimates, and the amounts required may be more or less than those given.)

2,500 reams MANIFOLD PAPER, 10x15, in books. Reams 960 sheets, 10x15, when made up in books with covers must not weigh over 2½ pounds.

Samples furnished and required.

Deliveries on account of contract must be fully equal in quality to such samples. Delivered in lots of 50 reams or more at our Supply Department, in New York or Chicago.

8,000 Dozen Carbon Sheets, 10x15 inches. Best quality. Samples furnished and required.

Paper delivered on account of contract must be fully equal to samples. Sheets must be of bright lasting color, and moist; but not to the extent of discoloring the manifold paper by mere contact. To be put up in packages of one dozen, interleaved, and have a sheet between each dozen; and each package to be covered, on delivery, with stout card-board, in lots of fifty dozen. Manifold Paper and Carbon to be delivered half size, namely: 7½x10 inches, when required, put up in same manner as office size, and delivered without extra charge for cutting.

It is understood that contracts made in accordance with these proposals shall be valid and binding from the first day of February, 1883, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Telegraph Company may require the goods contracted for.

Bills to be paid between the 15th and 25th of the month following the delivery.

The right is reserved to reject any and all bids, or to accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond, with two sureties, for the proper fulfillment of the contract.

Each bid must include the delivery at the Supply Department, in New York or Chicago, free of charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR MANIFOLD AND CARBON PAPER."

WM. HUNTER,
Supt. Supplies.

New York, December 20th, 1882.

A copy of this specification must accompany each bid.

PROPOSALS FOR OFFICE WIRE.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock, noon, Wednesday, Jan'y 10th, 1883, for 6 months' supply of cotton covered office wire.

(The quantity named is only an estimate, and the requirements for the six months may be greater or less than here given.)

Estimated quantity required: 10,000 pounds. To be No. 16 B.W.G. (.065 inch diameter), the copper to be at least 90 per cent. purity. The wire will be insulated in two manners: One consisting of three separate coverings of paraffined cotton—the other consisting of a single covering of the same. The copper to be well centred, and the covering to be firm, free from flaws, and close; and in both cases, braided—not wrapped.

Samples of wire to be submitted with bid; and all wire furnished on account of contract to be subject to inspection and acceptance by an officer of the company.

The right is reserved to reject any and all bids, or to accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond, with two (2) sureties, for the proper fulfillment of the contract.

Deliveries on account of contract will begin on February 1st, 1883, or as soon thereafter as required.

Bills to be paid between the 15th and 25th of the month following the deliveries.

Each bid must include delivery at the Supply Department, in New York or Chicago, free of charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR OFFICE WIRE."

WM. HUNTER,
Supt. Supplies.

New York, December 20th, 1882.

A copy of this specification must accompany each bid.

PROPOSALS FOR LAG SCREWS AND WASHERS.

THE WESTERN UNION TELEGRAPH CO. invites proposals until 12 o'clock, noon, Monday, Jan'y 8th, 1883, for 6 months' supply of the following named articles:

(The quantities named are only estimates, and amounts required may be more or less than those given.)

100,000 Lag Screws, 7x½ in. or sizes such as may be required, and equal number of Washers. To be made of the best refined iron, and delivered at Chicago as required.

75,000 Lag Screws, 7x½ in. or such sizes as may be required, and equal number of Washers. To be made of the best refined iron, and delivered at New York as required.

Bids for Lag Screws and Washers to be by the pound.

Bidders will be required to furnish four samples of the lag screw which they propose to furnish, marked with name of bidder and date of proposal.

Bidders will please observe all the terms of these specifications and make their proposals strictly in accordance with the same.

It is understood that the contract made in accordance with these proposals shall be valid and binding from the 1st day of February, 1883, for 6 months, and that deliveries on account of it shall begin on that date, or as soon thereafter as the telegraph company may require the goods contracted for.

Bills to be paid between the 15th and 25th of the month following the delivery.

The right is reserved to reject any and all bids, or to accept any which may seem for the best interests of the Company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Each bid must include delivery at Supply Department, New York or Chicago, free of charge for freight, package and cartage.

Proposals should be sealed and addressed to the undersigned, endorsed

"PROPOSALS FOR LAG SCREWS AND WASHERS."

WM. HUNTER,
Supt. Supplies.

New York, Dec. 18th, 1882.

A copy of these specifications must be attached to each bid.

PROPOSALS FOR HARDWARE.

THE WESTERN UNION TELEGRAPH COMPANY invite proposals until 12 o'clock, noon, Monday, Jan'y 8th, 1883, for furnishing 6 months' supply of the following named articles:

(The quantities given are only estimates, and the requirements may be greater or less than here stated.)

118 Doz. LOWE HANDLED SHOVELS, Ames', or equally good All Steel. Round Point, No. 2, with 6-foot handles.

12 Doz. HAND SAWS. "Pease's" or equally good, 30 inch, 8 points to inch, No. 35.

7 Doz. COLLINS' AXES—Handled, or equally as good, 4½ to 6 pound heads.

25 Doz. HAMMOND'S, or equally good, SHINGLING HATCHETS, No. 4.

8 Doz. HAMMOND'S or equally good BROAD HATCHETS, Nos. 1, 2, and 4. Please give price for each kind. Proportion of each kind required cannot be exactly stated.

100 Telegraph Snow-Bars, 7 ft long, made from 1½ inch octagon cast steel, No. 2. Each bar to be guaranteed of material as represented.

Samples must be submitted plainly marked with bidder's name and date of proposal.

100 Kegs. "Anchor" or equally good Brand, CUT NAILS, 10d. to 60d. Delivered at Supply Department, New York.

900 Kegs. "Anchor" or equally good Brand, CUT NAILS, 10d. to 60d. Delivered at Supply Department, Chicago.

It is understood that the contracts made in accordance with these proposals shall be valid and binding from the first day of February, 1883, and that deliveries on account of them shall begin on that date, or as soon thereafter as the Tel. Co. may require.

All goods are to be subject to strict inspection, and acceptance or rejection by an officer of the company.

Deliveries are to be made at the Supply Department, New York City or Chicago, as required.

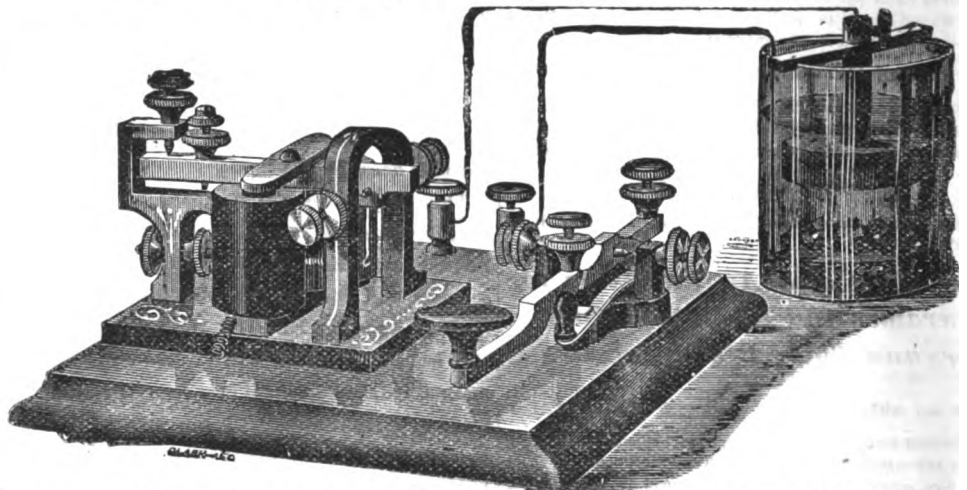
Bills to be paid between the 15th and 25th of the month following deliveries.

The right is reserved to reject any and all bids, or to accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond, with two (2) sureties, for the proper fulfillment of the contract.

Each bid must include delivery at our Supply Department.

Premium Learners' Apparatus. ONLY \$5. Not The Cheapest, But Guaranteed The Best.



THE PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER PERFECTED," and the "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Callaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5, when the money accompanies the order.

These Instruments are the exact size and form of those upon which we received the highest award at the late Centennial Exhibition over all competitors. Everything reliable, and so guaranteed, or money refunded. Our Book of Instruction contains full and explicit information as to setting up the battery, running of wires, &c.

Price, Complete Outfit.....\$5.00. Instrument without Battery.....\$4.20. Instruments wound with finer wires for lines of 1 to 15 miles, \$5.00; Cell of Battery, Complete, 80 cents; Premium Sounder, Separate Base, \$2.50; Premium Key, Separate Base, \$1.75; Premium Learners' Instrument, Key and Sounder entirely Nickel-plated, without Battery, \$5.20; Complete Nickel-plated Instrument, with Battery and Outfit, \$6.00; Sounder, Separate Base, \$3.25; Key, \$2.00; Money in advance.

Instruments without Battery, sent by mail, 55 cents extra. Battery Jars cannot be sent by mail. All orders will receive our prompt and careful attention. To prevent delay in shipment full shipping instructions with town, county and State, should be given. Remittances should be made by P. O. money order, registered letter, draft or express, which will insure safe delivery. Send for catalogues and circulars before purchasing elsewhere.

PARTRICK & CARTER,
Manufacturers of Telegraph Instruments and Supplies,
114 South Second Street, Philadelphia, Pa.

New York or Chicago, without charge for freight, package or cartage.

Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR HARDWARE."

WM. HUNTER,
Supt. Supplies.

NEW YORK, December 18th, 1882.
A copy of these specifications must accompany each bid.

PROPOSALS FOR ENVELOPES.

THE WESTERN UNION TELEGRAPH COMPANY invites proposals until 12 o'clock noon, Monday, Jan'y 8th, 1883, for 6 months' supply of No. 5 Manilla Envelopes.

(The quantity named is only an estimate, and the amount required may be more or less than that given.)

Estimated quantity for six months 24,000,000, No. 5 Manilla Envelopes 3½ lbs. per thousand, all printed alike. To be delivered in packages of 500, with bands, packed in wooden boxes if necessary, in quantities as required.

Bidders must agree to commence the delivery of envelopes within twenty days after the award of contract and furnish five millions per month, if so many are required, and will please state additional price per thousand, at which they will furnish these envelopes with Office Address, or any other printing necessary, in lots of not less than one thousand. All envelopes to be delivered at the Supply Department, or on board, in New York, and no charge to be made for freight, cartage or boxing. Two samples of envelopes proposed to be furnished, must in all cases accompany the proposals.

Bills to be paid monthly, between the 15th and 25th of the month following the deliveries.

The right is reserved to reject any and all bids or accept any one which may seem for the best interest of the company.

The party whose tender is accepted will be required to give bond with two (2) sureties for the proper fulfillment of the contract.

Bidders may be present in person or by attorney, at the opening of the bids, should they so desire. Proposals should be sealed and addressed to the undersigned, endorsed,

"PROPOSALS FOR ENVELOPES."

WM. HUNTER,
Supt. Supplies.

NEW YORK, Dec. 20th, 1882.
A copy of this specification must be attached to each bid.

WESTERN SCHOOL OF TELEGRAPHY,

JANESVILLE, WIS.

This Institution not only teaches Telegraphy in a thorough manner, but places its graduates in offices where, receiving a small salary at first, they are enabled to work upward according to their ability. This is done by virtue of an arrangement of nine years' standing with the Chicago City Lines of the Western Union Telegraph Co., having over 100 offices. We supply all operators employed on these lines, they first being placed in sending offices, and afterwards promoted on their merits. Since 1874 we have supplied them with over 700 operators.

The superintendents of telegraph of the different railroads centering at Chicago, employ many men from the city lines, thus making a constant and steadily increasing outlet for the students of this school.

We do not pretend to make our students FIRST-CLASS operators, nor to obtain for them FIRST-CLASS situations. We simply claim to make them competent to manage a minor office where they have every opportunity to perfect themselves while receiving a small salary from the start.

Liberal cash premiums will be paid to any person sending students to this school.

Correspondence solicited.

RICHARD VALENTINE, } MANAGER
A. M. VALENTINE, }

N. B.—To Railroad Companies in need of Operators we can send reliable young men well advanced in telegraphy, and only needing a few weeks practical work to fit them to run an office, who will go to any station for practice, and assist the agent without pay until assigned to duty. Having made this a specialty for years we can guarantee satisfaction. We have furnished the following Companies in this way: Wisconsin Central, Green Bay & Minn.; St. Paul, Minneapolis & Manitoba; Chicago, St. Paul, Minneapolis & Omaha; Burlington & Northwestern and Chicago & Grand Trunk, and others.

We can also furnish, on short notice, experienced operators competent to manage any ordinary office, and reliable in every respect.

A GREAT OFFER.

To Superintendents, Managers, Purchasing Agents
and others having on hand

Worn Out, Damaged or Useless Morse Keys,

We will, until further notice, furnish our

New Steel Lever Keys

in exchange for all old keys for a cash difference of \$1.66 each. This price applies to any number of keys, no matter in what condition the old ones may be. They must be delivered to us, in packages plainly marked KEYS, with all charges PREPAID, and remittance should accompany the orders, except from Superintendents and Purchasing Agents of well-known Companies.

Now is the time, while the offer holds good, to get together all of your

Used-up and "Bad" Keys

and exchange them for splendid New Ones. See description and advertisement of Steel Lever Key. Send for circular.

J. H. BUNNELL & CO.,

112 Liberty Street, N. Y.

FREE!

Complete Instruction in Telegraphy

If you wish to know all about learning Telegraphy, constructing and operating Short Lines of Telegraph, &c., send your address, by postal card or letter, and get J. H. Bunnell & Co.'s Manual of Instruction for Learners of Telegraphy, latest edition, which we will send

FREE OF CHARGE,

to all who apply, by mail or otherwise.

It is the plainest and best book of instruction in Telegraphy ever published, being fully complete in description, explanation and illustrations.

J. H. Bunnell & Co.,

112 Liberty Street, N. Y.

Another Great Reduction in Prices !

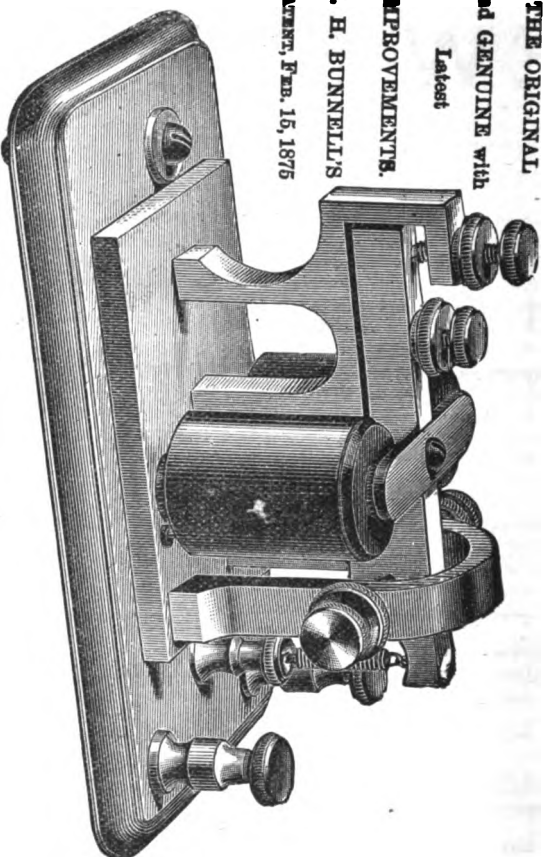
THE ORIGINAL
and GENUINE with

Latest

IMPROVEMENTS.

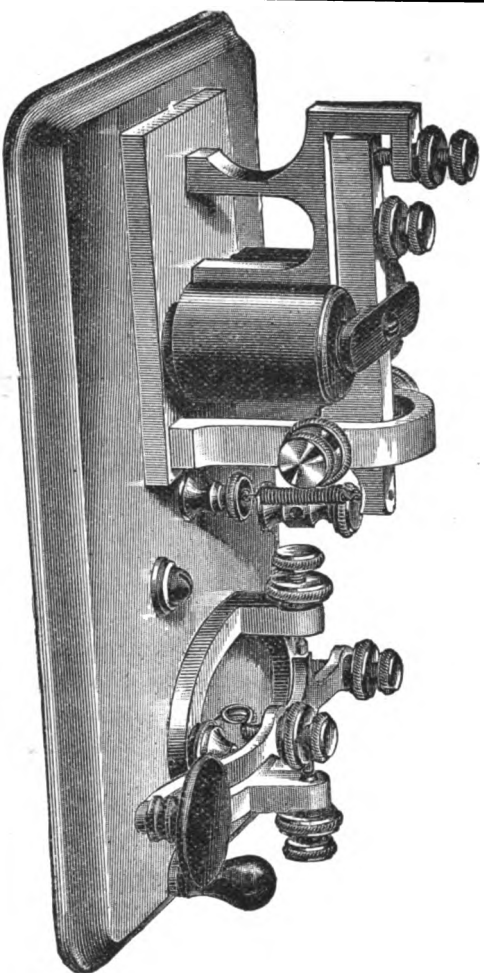
J. H. BUNNELL'S

PATENT, FEB. 15, 1876



THE GIANT SOUNDER—UNEQUALLED ! \$4.00.

We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE \$4.00, carefully boxed and sent by mail, prepaid, to any part of the United States.



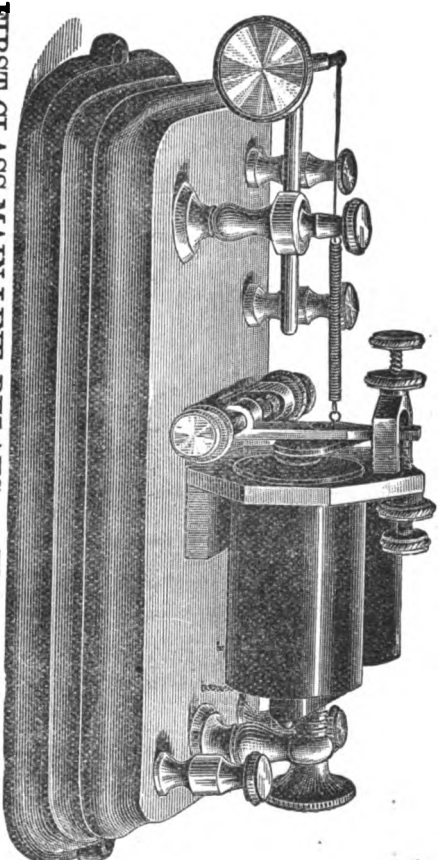
GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET : \$7.50.

For Private Wire, Main Line, etc., up to 35 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 50 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE \$7.50, carefully boxed and sent by mail, prepaid, to any part of the United States.

All of these prices subject to liberal discount on orders in quantity.

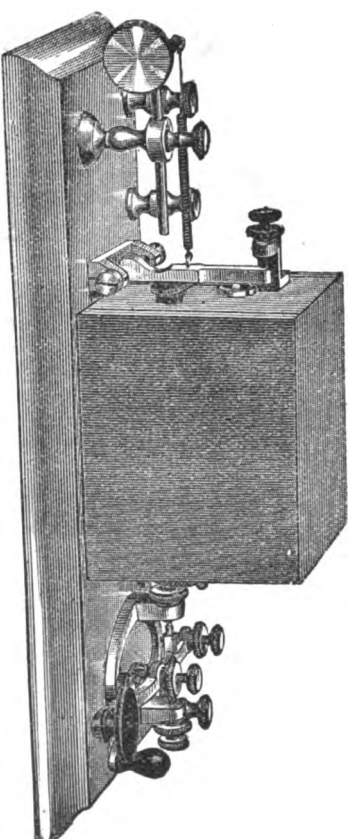
J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.



\$7.50.

FIRST CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Base, Extension Adjustment. Price, \$7.50, g



\$11.00.

BOX SOUNDING RELAY AND STEEL LEVER KEY.

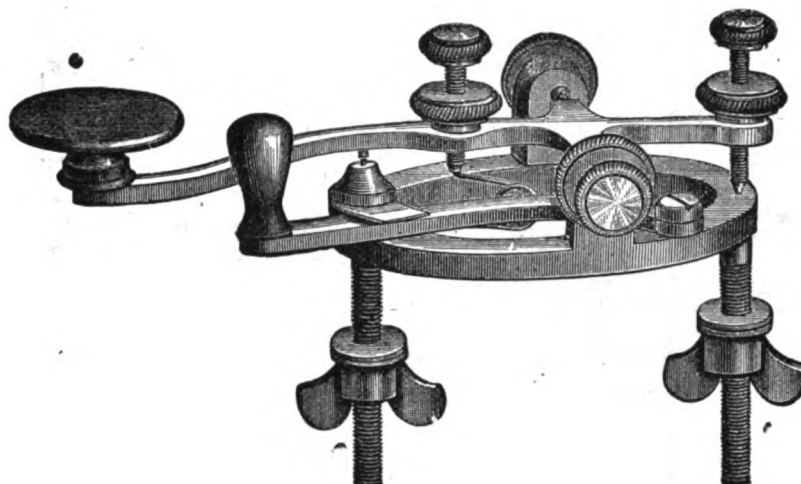
COMBINATION SET.

or Main Lines up to 600 miles in length. Of best construction for loud, clear sound without least sounder. Polished Mahogany Box and Base ; 150 ohms Silk Wire. Price, with Steel Lever Key on base, \$11.00 ; without Key, \$8.50.

Send for estimates if you want low prices and first-class apparatus.

J. H. BUNNELL & CO'S NEW STEEL LEVER ^{SOLID TRUNNION} KEY.

BEST IN THE
WORLD.



PATENTED Feb. 15
1881.

We have much pleasure in being first to make and bring to the notice of Telegraphers and Managers of Telegraphs this new and important improvement in keys.

We offer it as being *more durable* and in every respect *better* than any other for rapid and perfect sending for the following reasons:

The Lever is *only one-half the weight* of the ordinary brass lever as generally made.


The entire Lever and Trunnions together being made of *but one piece* of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of *hardened platina points*, *sticking is absolutely prevented*.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

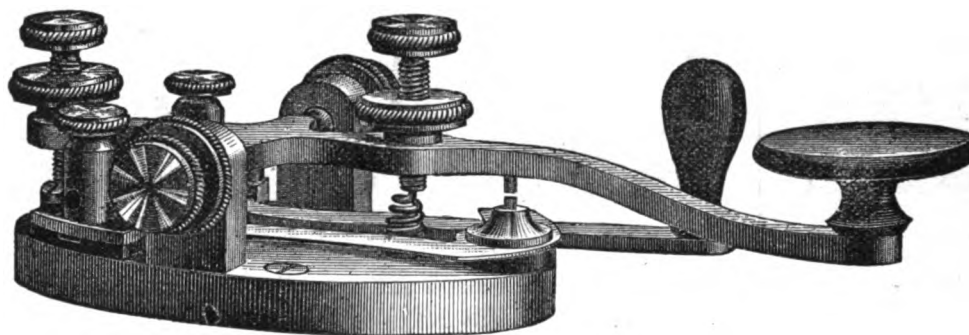
PRICE, \$3.00. Finely Finished, and Lever Nickel-Plated.

Liberal Discount on Orders for Compay Supply.

 Steel Lever Key sent by mail, post-paid, to any part of the U. S. or Canada on receipt of the above price, by Registered Letter or Money Order.

 **NOTICE.**—Beware of the absurd attempts at imitation of these Keys which continue to be put forward from various sources. The BUNNELL STEEL LEVER KEY is the **ONLY ONE** having the **SOLID TRUNNION**, together with **ALL** the other merits of beauty and perfection which have caused it to be adopted everywhere as **THE BEST KEY IN THE WORLD.**

Legless Pattern Steel Lever Key.



A Beautiful and perfect Key suitable for Use on Fine Desks, or wherever a Legless Key is preferable. **PRICE**, carefully boxed, and sent, prepaid, by mail, to any part of the United States, \$3.50.

J. H. BUNNELL & CO., 112 Liberty Street, New York.

CHARLES WILLIAMS, JR.,
(ESTABLISHED IN 1856.)
109 COURT STREET, BOSTON, MASS.,
Authorized Manufacturer of
THE AMERICAN BELL TELEPHONE CO.



Magneto Crank and Push Button Call Bells, Electric Bells,
District Bells and Switches for Exchanges, Annunciators, etc.

TELEGRAPH & ELECTRICAL INSTRUMENTS,
Batteries, Wire, Insulators and
Telephone Supplies of Every Description.

Geo. WESTINGHOUSE, Jr. Pres. ROBERT FITZGERALD, Treasurer.
O. H. JACKSON, Vice Pres't and Gen'l Manager.

ASAPH T. ROWLAND, Secretary. HENRY NYDER, General Agent,
THE UNION SWITCH & SIGNAL CO.,

PITTSBURGH PENNA.

A consolidation of

The Union Electric Signal Co., of Boston, Mass., and of
The Interlocking Switch and Signal Co., of Harrisburg, Pa.
sole Owners and Manufacturers of the only practically suc-
cessful

**SYSTEM OF OPERATING RAILROAD
SIGNALS AUTOMATICALLY.**

Also of Apparatus for Operating and Interlocking Switches,
signals and Gates by Levers, Hydraulics, Pneumatics or Elec-
tricity.

Also, Manufacturers of Frogs, Crossings, Switches and Switch
Stands.

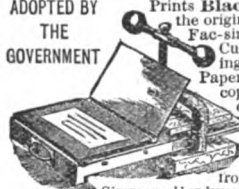
Plans, estimates and detailed descriptions, together with
references to apparatus in practical operation, will be furnish-
ed upon application.

OFFICE AND WORKS:

Corner Fayette Street, Garrison Alley and Duquesne Way.

ZUCCATO'S PAPYROGRAPH

ADOPTED BY
THE
GOVERNMENT



Prints Black, Violet, or Red, from
the original writing, Autograph
Fac-simile Circulars, Prices
Current, Music, Draw-
ings, School Examination
Papers, etc., in a common
copying press, at the rate
of 500 per hour. The
most rapid, sim-
ple, and economi-
cal process known
1000 to 5000 printed
from a single writing. The
Simmons Hardware Co., of St. Louis, says
of it: "Our Papyrograph, purchased some time since,
gives entire satisfaction. Would not be without it for
\$1,000 a year." For specimens of work, price-list, etc.,
address, with stamp, THE PAPYROGRAPH CO., 41
to 45 SHUTTER STREET, NORWICH, CONN. Local
Agents wanted.

TO INVENTORS.

I make a specialty of taking out patents for
ELECTRICAL INVENTIONS.

References and full information by mail on request.

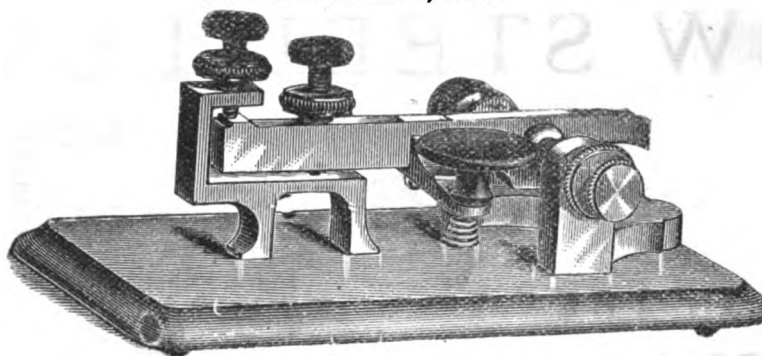
W. B. HALE, Solicitor of Patents.

Former First Ass't. Examiner in charge of Class of
Electricity, U. S. Patent Office. Office: No. 617 Seventh St.,
Washington, D. C.

Printed copies of any patents, with drawings, sent for
net cost, ten cents each, and a one cent postage stamp.

NEW MECHANICAL TELEGRAPH INSTRUMENT.

PATENTED APRIL 4, 1882.



COMBINED KEY AND SOUNDER.

NO BATTERY REQUIRED.

Works perfectly as a KEY, with sound equal to the best SOUNDER
For MORSE ALPHABET PRACTICE in sending and reading by sound, and for TEACHING
THE MORSE ALPHABET. Can be carried in the pocket or a small satchel, and is *always ready for use*.
Price, with Telegraph Instruction Pamphlet, packet of Morse Alphabet Cards, etc., \$1.50. Sent
anywhere in the United States by mail, prepaid, on receipt of price in stamps, money order, or register-
ed letter.

J. H. BUNNELL & CO., Telegraph and Telephone Supplies,
112 Liberty Street, New York.

HAVE YOU RECEIVED

—ONE OF—

J. H. BUNNELL & CO.'S

NEW, LARGE,

**ILLUSTRATED CATALOGUES
OF MAY, 1882?**

If not, send your address by postal card or letter and you will get one by return mail
It contains Illustrations, descriptions, and the

BOTTOM PRICES

of all things Telegraphic, including the latest and best designs of Telegraph Instru-
ments of every description, together with all Telegraph and Telephone

LINE MATERIALS.

TOOLS & SUPPLIES.

We are thoroughly practical in every department, and our manufactures and
selections will be found well suited to meet all the needs of

IMPROVED MODERN TELEGRAPH SERVICE.

J. H. BUNNELL & CO., 112 Liberty Street, New York.



The Works of the Jno. A. Roebling's Sons Co., at Trenton, N. J., have facilities for producing large quantities of Telegraph
Wire on short notice. The Belgian system of rolling long lengths of wire rods, and improved methods of galvanizing, were
first introduced in the United States at these works. It insures the production of wire with few joints, and a thick coating
of zinc.

Western Electric Company,

Factories at
CHICAGO,
NEW YORK,
and INDIANAPOLIS.

MANUFACTURERS OF

TELEGRAPH INSTRUMENTS AND SUPPLIES,

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mercurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANSON STAGER, *President.*

ENOS M. BARTON, *V.-President.*

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

| | PAGES. | PRICE |
|---|--------|-------|
| I—Complete Set of Catalogues..... | 228 | 20c. |
| II—Telegraph Instruments and Supplies | 64 | 5c. |
| IV—Insulated Wire (included in II) | | |
| V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm..... | 32 | 3c. |
| VI—Electro-Medical Apparatus..... | 32 | |
| VII—Manual of Telegraphy and Catalogue of Private Line Instruments..... | 32 | free. |
| VIII—Condensed Price List..... | 20 | free. |
| X—Electric Bells, etc. Descriptive..... | 12 | 3c. |
| XI—Magnets for Mills..... | 20 | 3c. |
| See Wm. Thomson's Electrical Instruments... | 24 | 5c. |

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FIBERED

INSULATED TELEGRAPH WIRE,

TELEPHONE AND ELECTRIC CORDAGE,

MAGNET WIRE,

PATENT RUBBER-COVERED WIRE,

BURGLAR ALARM AND ANNUNCIATOR WIRE

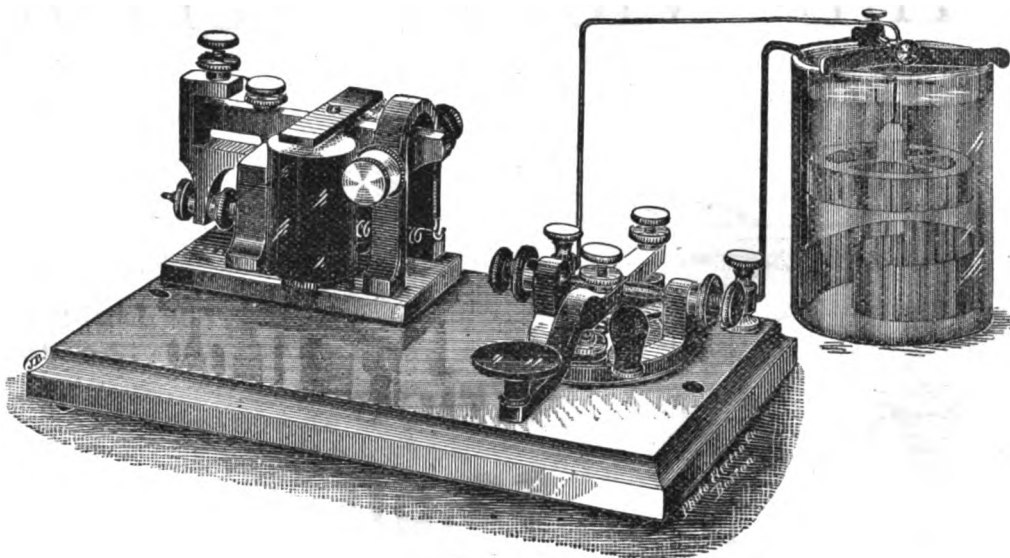
LEAD-ENCASED WIRE, CABLES, ETC.

OFFICE AND FACTORY: 67 STEWART STREET,

PROVIDENCE, R. I.

W. H. SAWYER, *Electrician and Shop.*

JEROME REDDING & CO.'S LEARNERS' INSTRUMENT.



Price for the Complete "Gem" Learners' Outfit. \$3.75.

Consisting of the above large sized Sounder and Key, a large Cell of Callaud Battery, one roll of Office Wire, Book of Instructions, Chemicals, etc. *The only low-priced Learners' Instrument that has nicely finished BRASS Sounder and Key Lever, with perfect adjustments for both.*

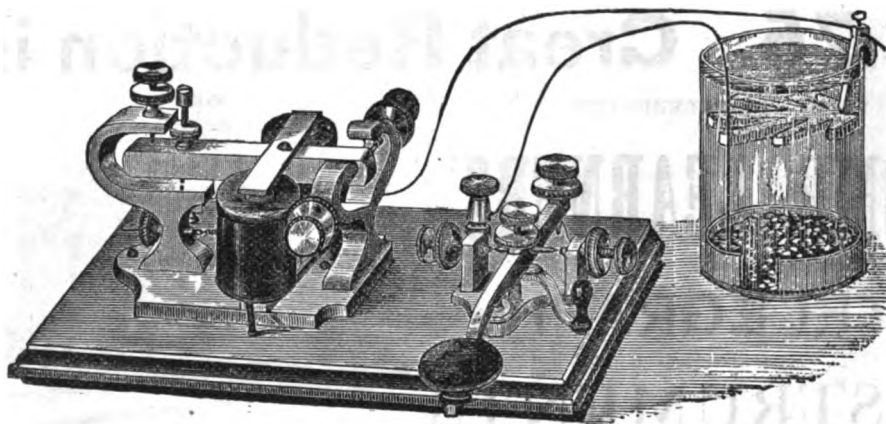
| | | | | | |
|--------------------------------|---|--------|--|--|------|
| Price for Complete Outfit..... | | \$3.75 | Price for Instrument alone, by mail, post-paid, \$3.60 | | |
| " | Instrument alone..... | 3.06 | " | Instrument alone, for lines 1 to 15 miles..... | 3.60 |
| " | the whole outfit (except Glass Jar), with Key and Sounder separate, by mail, post-paid..... | 4.32 | " | Instrument alone, for lines 1 to 15 miles, by mail, post paid..... | 4.05 |

JEROME REDDING & Co., Manufacturers of Telegraph & Electrical Supplies.
No. 30 Hanover Street, Boston, Mass.

30 DAYS TRIAL. LITTLE GIANT. FRENCH BATTERY.

Endorsed by the most eminent Physicians for the cure of Operators Cramps, Rheumatism, Neuralgia, and all Nervous Diseases and Weakness. Every Operator should have one. A. B. Connor, of Piedmont, W. Va., says: "I have successfully managed to remove Rheumatism from my left knee to my left shoulder, and from my shoulder it is now gone to parts unknown to me, with the use of your 'Little Giant' Battery." Sent by express subject to inspection. Price complete, \$6.00. Send for Circular.

AGENTS WANTED. C. E. Jones & Bro., 4th & Walnut Sts., Cincinnati, Ohio.



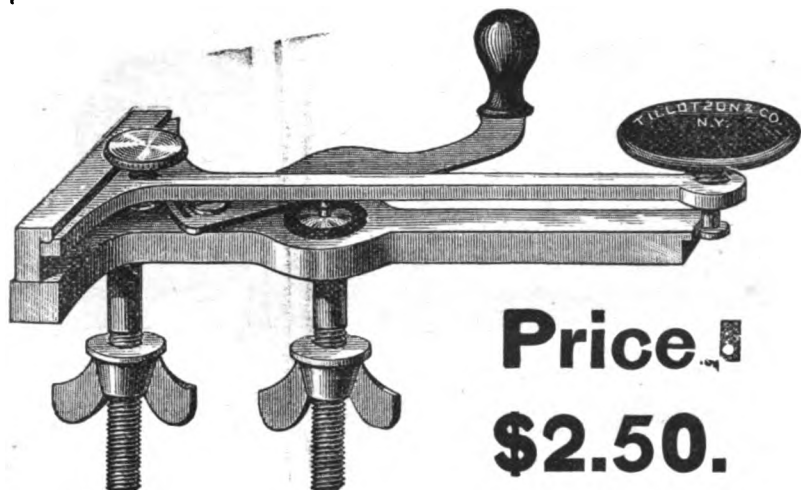
No. 2 O. K. OUTFIT.

The above complete office outfit for \$4.50 consists of Sounder, Key, either on 1 base or separate, 5x7, Callaud Battery, Book of Instructions, 15 feet office wire, 1 pound vitriol. These are a perfect success, sent O. O. D., with privilege to examine before paying for them, send stamp for Catalogue of all kinds of Telegraph Goods.

This Key has Pure Platinum Points.

A. B. LYMAN, 36 South Water St., Cleveland, O

THE "VICTOR" TELEGRAPH KEY.



Price
\$2.50.

PATENT APPLIED FOR.

*The Greatest Improvement in Telegraph Keys
ever made.*

THE EASIEST WORKING.

THE MOST POSITIVE CONTACT.

The Lightest Lever.

The Most Perfect in Construction.

No Trunnion Connections.

No Side Motion to Lever.

No Back Adjusting Screw.

The Neatest, Nicest, Handiest and Best Key
in the World.

Since the earliest days of Morse Telegraphy there has been little or no radical change in Telegraph Keys until the invention of the Victor Key.

Telegraphers who take hold of the "Victor" Key will at once notice that there are but two points of adjustment to regulate. These are the play of the lever and the stiffness of the spring. There are no loose trunnions to tighten up, and no tight trunnions to loosen. The lever can never move to one side or the other; and the point can never be worn into wedge shape. The play of the lever must of necessity be directly up and down, without side motion; and consequently the points must always strike fairly and squarely. The imperfect trunnion connections of all old style keys are completely done away with in the "Victor," and the five minutes' labor of the "relief" operator in twisting adjustment screws to get his key lever to work "to suit" are at once ended. These are the most prominent points that will present themselves to the Telegrapher who uses the "Victor" key for the first time. Add thereto the light ~~steel~~ lever, which also prevents wearing of the connection, and the long leverage, and you have the two leading advantages claimed for the most perfectly improved of modern telegraph keys. By a turn of the knob to the left the play of the lever is decreased, or by a turn to the right it is increased, thus avoiding the imperfect set screw adjustment heretofore universally in use. These advantages present themselves so clearly and emphatically to every telegrapher that this key has only to be tried to receive the commendation already universally accorded it by every telegraph man who has examined it, which is "THE BEST KEY I EVER SAW."

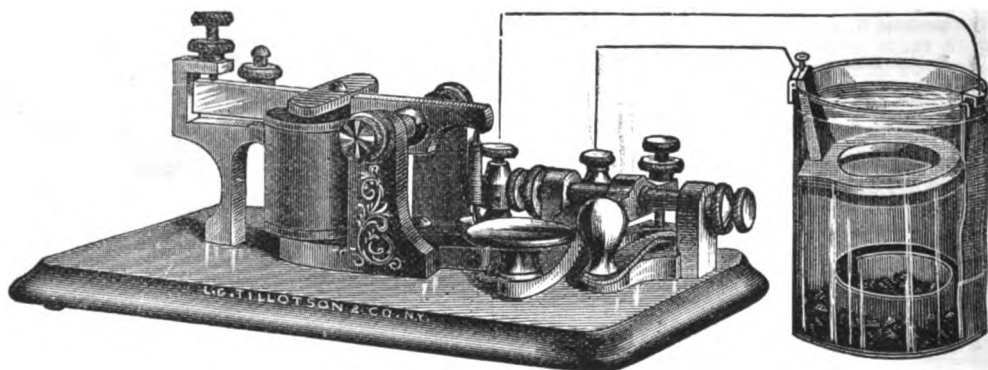
To enable all to test the merits of this great invention, we will, on receipt of price, \$2.50, send, post-paid, by registered mail, to any part of the United States or Canada, a sample VICTOR KEY.

VICTOR KEY mounted on highly polished Hard Rubber Base, with Top Connections, \$3.00, post-paid.

\$3.75. Great Reduction in Price \$3.75.

OF THE CELEBRATED

HOME LEARNERS' TELEGRAPH INSTRUMENTS



Owing to the great demand for these popular instruments, we have been compelled to enlarge our facilities for their production, and are now making them in such quantities as to admit of a considerable reduction in price, which reduction we now give our customers the advantage of. All of these instruments will be manufactured as heretofore in the best manner, and they will be found the best Student's Apparatus in the market.

For the above Complete and Perfect Sounder and Key Combined, on mahogany base, including Battery, Chemicals, Wire, Book of Instruction and everything necessary for a first-class Telegraph Outfit for the Student's use, for practice at home, or for operating all Short Lines of Telegraph, net cash..... \$3.75
Instruments for short circuit, without Battery..... 3.00
Same by mail, post paid..... 3.50

Instruments without Battery, wound with fine wire, for lines 1 to 15 miles..... \$3.75
Same by mail, post-paid..... 4.25
Cell of Battery..... .65
Instruction Book..... .30
Galvanized Telegraph Wire, per 100 feet..... .30
Remit by Postal Money Order, Draft or Registered Letter,

MANUFACTURED ONLY BY

L. G. TILLOTSON & CO.,

Manufacturers and Dealers in TELEGRAPH AND TELEPHONE SUPPLIES of Every Description,
Nos. 5 and 7 Dey Street, New York.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT 158—October 31, 1882.

CHARLES B. NOTES.**HENRY C. MAYNARD.**

CHARLES B. NOTES died in New York City, September 26, 1882, of Aneurism of the Aorta. His certificate, No. 3081, was issued August 17, 1877.

The above claim will be paid from surplus.

HENRY C. MAYNARD died at Geneva Lake, Wis., October 30, 1882, in a Congestive Chills. His certificate, No. 2967, was issued April 13, 1877.

One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4293.

Insurance expires Nov. 30, 1882; Membership Dec. 30, 1882.

The number of members of the Association in good standing is: 1st Division, 2324; Second Division, 139.

Net increase in membership, First Division, since last assessment: 21.

ASSESSMENT 159.—December 1, 1882.

MORRIS E. MOSBY.**WILLIAM W. CUMMINGS.**

MORRIS E. MOSBY died at Jacksonville, Ala., October 5, 1882, of Congestion of the Brain. His certificate, No. 4012, was issued September 19, 1881.

The above claim will be paid from surplus.

WILLIAM W. CUMMINGS died at Toledo, Ohio, October 26, 1882, of Bright's Disease of the Kidneys. His certificate, No. 294, was issued February 26, 1869.

One dollar is due to meet this assessment, from member holding Certificates up to and including No. 4294.

This claim should be paid before December 31, 1882, as Insurance expires on that day. Membership expires January 30, 1883.

The number of members of the Association in good standing is: First Division, 2336; Second Division, 140.

Net increase in membership, First Division, since last Assessment: 12.

BY-LAWS—SECTION VIII. "Upon the death of a member of the Association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and in case payment shall not be made within 30 days thereafter, the delinquent shall forfeit all claim to the benefits of the Association; and should payment not be made within 60 days, shall forfeit membership, to which said delinquent can only be restored as provided in Section VII. of these By-Laws."

A. B. BREWER,Secretary,
NEW YORK.

P. O. Box. 3175

KERITE INSULATED**TELEGRAPH WIRES AND CABLES.****KERITE IS INDESTRUCTIBLE.**

AFTER YEARS OF THE SEVEREST TESTS IT IS ADMITTED
TO BE THE BEST INSULATOR KNOWN.

IT LASTS FOR YEARS

In earth, air or water, and is recommended and endorsed by
all the leading men in the telegraphic profession.

THE**DURABLE QUALITIES OF KERITE****RECOMMEND IT AS THE****CHEAPEST AND MOST ECONOMICAL**

insulator for all telegraphic purposes.

**OFFICE, AERIAL, SUBMARINE AND UNDERGROUND
CABLES.**

of any number of conductors or size of insulation, furnished
at short notice.

INSULATED WIRE

of all sizes for

OFFICE, LINE OR BATTERY USE

always on hand. Also for sale by all dealers in telegraphic
material.

For further particulars address,

A. G. DAY,

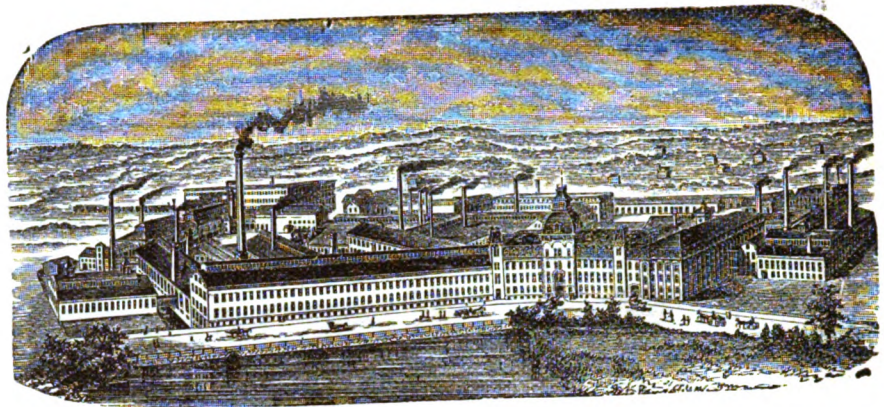
Sole Patentee,

120 BROADWAY, NEW YORK.

, B. HOTCHKISS, General Agent.

TELEGRAPH WIRE.**WASHBURN & MOEN MANUFACTURING COMPANY.**

ESTABLISHED 1861. CAPITAL \$1,500,000.

**WORCESTER, MASS.**

21 OLIV STREET, NEW YORK.

215 LAKE STREET, CHICAGO.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequaled in that particular.

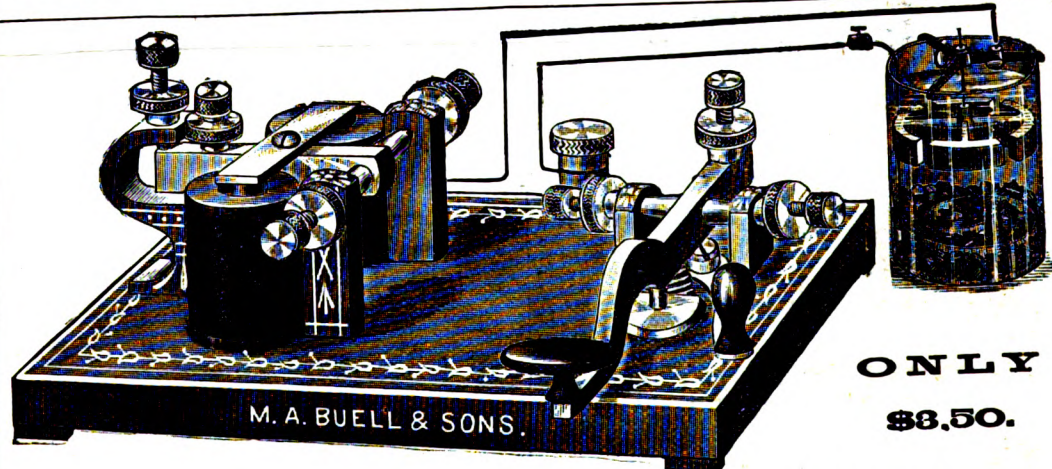
Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE,

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph, as well as of Telephone Wire, which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL,**PATENT CONTINUOUS GALVANIZING BATH,****AND THE BELGIAN ROLLING MILL,**
(In connection with the DOUGLAS ROLLING FURNACE.)

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation. Prices and terms for Telegraph or Telephone Wire, Plain, Oiled or Galvanized, given upon application. N. B.—The qualities known as Extra Best Best (E. B. B.) and Best Best (B. B.), kept constantly in stock.

**ONLY
\$8.50.****THE STAR INSTRUMENT, guaranteed to be Perfect and good for 5 miles or less.**

| | |
|---|--------|
| Outfit, including Wire, Vitriol, Book, etc., cash with order, | \$3.50 |
| Outfit, without Battery, cash with order, | 3.00 |
| Outfit, without Battery, sent by mail for | 3.50 |

M. A. BUELL, 144 Superior St., Cleveland, O.

General Dealers in all kinds of Telegraph Supplies.

FREE TO YOUBy Mail, on receipt of 25c. in currency or stamps.
HOW TO BECOME A TELEGRAPH OPERATOR. The most complete illustrated

Telegraph Instruction Book in the world.

C. E. JONES & BRO.: Dear Sirs:—Instruction Book received O. K., and many thanks. It is worth five times what it cost. If a person could not learn to be an operator after studying it, THEY HAD BETTER GIVE UP. Yours truly,

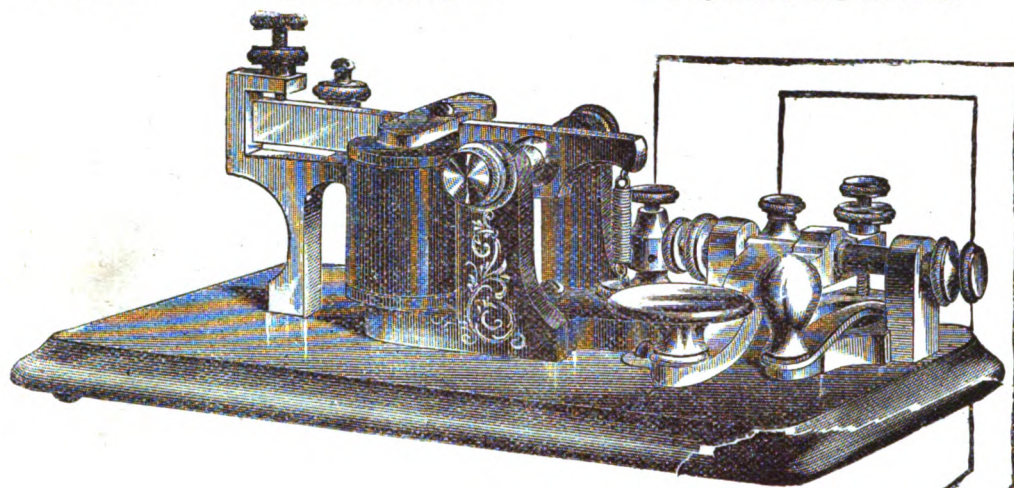
A. L. JAMES, Tipton, Tulare County, Cal.

NOW! RIGHT! NOW! while fresh in your mind, is the best time to send your order, before you misplace this paper and forget our address, and your opportunity is gone.

C. E. JONES & BRO., Telegraph, Telephone and Electrical Supplies,
No. 51 West Fourth Street, CINCINNATI, O.

The "Morse" Learners' Outfit \$3.75.

**GREAT
REDUCTION
IN
PRICE!!
THE BEST.**



THE BEST.

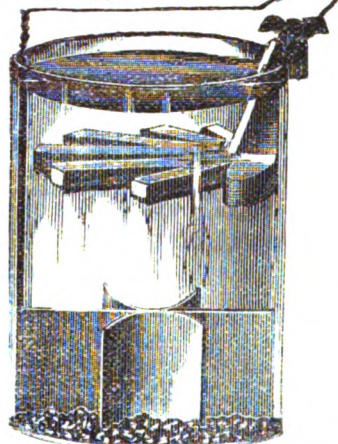
Price, \$3.75, complete with Battery, Book of Instruction, Wire, Chemicals, and all necessary materials for operating.
 "Morse" instrument alone, without battery..... \$3.00
 "Morse" instrument without battery, and wound with fine wire for lines of one to fifteen miles..... 3.75
 Cell of battery complete..... .65
 "Morse" Learners' Instrument, without battery, sent by mail..... 3.50
 (Battery cannot be sent by mail.)

Instruction Book FREE.

Goods sent C. O. D. to all points if one-third of the amount of the bill is sent with the order.

Remit by Draft, Postal Money Order, or Registered Letter.

Favorable arrangements made with Agents everywhere.



The "Morse"
 Is a full-size, well-made, complete MORSE TELEGRAPH apparatus of the latest and best form for learners, including handsome Giant Sounder and Curved Key, and a large Cell of the best Gravity Battery, latest form.

It is the best working set of Learners, Instruments for short or long lines, from a few feet up to 20 miles in length,

YET OFFERED!

**You are SURE of getting
THE BEST THAT IS MADE**

IF YOU SELECT THE "MORSE."

We will in every case refund any remittance made us for these goods, if they are not found to be Entirely Satisfactory.

J. H. BUNNELL & CO., 112 LIBERTY ST., NEW YORK.



YOUR NAME

finely printed on 15 Bevel Gilt-edge Cards, with a small key, or Lightning from a clenched fist, or Pigeon with Envelope and the words "Telegraph" and "73," or a small and perfect engine engraved upon the upper turn-down corner, 16 for 25 cents, or 75 with assorted designs, with name, and business address, for \$1.00; sample of operators' cards, 10 cents; one morocco card case, two pockets, 10 cents. 15 Laughable Flirtation Cards, including Handkerchief, Fan and Glove Flirtation, 10 cents. 15 tinted portraits of actresses, 10 cents. 15 Komical Advertising cards, awful funny, 10 cents. 50 transparent picture cards, new subjects, with your name, 20 cents. One cabinet full size French Photograph of Actress, 10 cents. These are perfect beauties. \$1.00 per dozen, assorted, the same that others charge 25 and 35 cents each for. Agents wanted to receive orders for the finest and largest assortment of visiting cards, French and American chromo cards in the United States, all put up in fine book form, with full instructions, postpaid, for \$1.00. Agents allowed 25 per cent. of selling prices. 100 business cards furnished with every outfit. Give your name and address plain, so that there will be no mistake. Since I started in the card business in 1870 this year's outfit goes far ahead of all.

5 CENT SHEET MUSIC.

I am prepared to furnish all the latest and popular pieces of the day for only five cents each. Full sheet music size, and the same in every respect that sells for 30 and 75 cents each, that being the price printed on the music. Catalogue of over 500 pieces for 3-cent stamp, or 10 cents for two pieces and catalogue, as two or more will cost no more by mail than one. 25 pieces for \$1.00, postpaid. Everybody wants Over the Garden Wall, When the Leaves Begin to Fade, Oscar Wilde Galop, Jumbo March, &c., &c. Agents can make money fast by ordering a large assortment to select from, especially in small towns where there is no music sold. Address, F. P. MUNN, CLYDE, Wayne Co., N. Y.

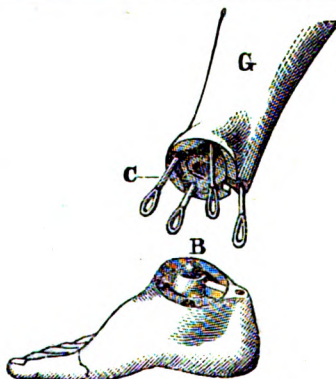


CALIGRAPH SOLD and orders filled immediately.

STENOGRAPHERS furnished business men without charge for my services.

SHORT-HAND TAUGHT. Send for circular to

W. G. CHAFFEE,
 Oswego, N. Y.



THE CELEBRATED BLY

ARTIFICIAL LIMBS.
 With or without universal ankle motion. Remodeled, Improved and Warranted for Five Years. Prices Reduced. Send for Free Pamphlet.
GEO. B. FULLER,
 Successor to DR. D. BLY, Rochester, N. Y.

Found at Last.

A CHEAP

COUNTER CLIP,

(Patented July 18, 1882.)

CHEAPER THAN PASTE.

Blanks Removed Without Tearing.

Price, post-paid, 15 cents. Per doz., post-paid, \$1.50. Discounts to the Trade or to Telegraph Co.s, in quantities. Larger sizes made on screw to wall, for Paper Bags, Wrapping Paper, &c. Circulars free. Address,

W. W. PRICHARD, Ironton, Ohio

YOUR NAME PRINTED ON 25 VIS-

ITING CARDS with telegraph key or bird engraved thereon for 10 cents. Address all orders to
W. E. MULFORD,
 Newport, Delaware.

SHORTHAND Writing thoroughly taught by mail or personally. Situations procured for pupils when competent. Send for circular. **W. G. CHAFFEE,** Oswego, N. Y.

I will teach any operator the Corresponding Style of Phonography, who will sell a Caligraph for me.

HALBERT E. PAINE, late Comm'r Patents. **STORY B. LADD,**

PAINE & LADD,

Solicitors of Patents and Attorneys in Patent Cases, Washington, D. C.



We continue to act as solicitors for patents, caveats, trade-marks, copyrights, etc., for the United States, and to obtain patents in Canada, England, France, Germany, and all other countries.

Thirty-six years' practice. No charge for examination of models or drawings. Advice by mail free.

Patents obtained through us are noticed in the **SCIENTIFIC AMERICAN**, which has the largest circulation, and is the most influential newspaper of its kind published in the world. The advantages of such a notice every patentee understands.

This large and splendidly illustrated newspaper is published **WEEKLY** at \$3.20 a year, and is admitted to be the best paper devoted to science, mechanics, inventions, engineering works, and other departments of industrial progress, published in any country. Single copies by mail, 10 cents. Sold by all news-dealers.

Address, **Munn & Co.,** publishers of Scientific American, 261 Broadway, New York. Handbook about patents mailed free.



